The Association between Alexithymia, Impulsivity and Negative Affect in Emotional and External Eating

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Table of Contents

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List of Tables

List of Figures

List of Abbreviations

ACC: Anterior cingulate cortex

BED: Binge eating disorder

BMI: Body Mass Index

BPD: Biliopancreatic diversion

DASS-21: Depression, Anxiety and Stress Scale Twenty One Items

DEBQ: Dutch Eating Behaviour Questionnaire

EDI-II: Eating Disorder Inventory Two

FFM: The Five-Factor Model of Personality

fMRI: Functional magnetic resonance imaging

IBD: Inflammatory bowel disease

PET: Positron emission tomography

PHQ: Problem History Questionnaire

TAS: Toronto Alexithymia Scale

TAS-20: Toronto Alexithymia Scale Twenty Items

Abstract

Emotional and external eating are common eating behaviours in the general population, while not disordered eating per se they have been linked to overeating, obesity and problems engaging in health behaviours. Theories of emotional and external eating have been around for decades however little is known of the factors that contribute to these eating behaviours. Emotional and external eating tend to co-occur, and high correlations between them have been reported. Some theorists have argued that they are not distinct constructs. The current study aimed to provide further understanding on the nature and distinction between emotional and external eating in a non-clinical sample. The associations of impulsivity, alexithymia and negative affect in emotional and external eating were investigated, utilising a cross-sectional design. These variables have been shown to be related to eating behaviour in clinical samples however there has been limited research in non-clinical samples. Emotional eating was positively associated with alexithymia, negative affect and lack of perseverance, the relationship with urgency was less clear. External eating was indirectly associated with depression through the mediating variable urgency. The results indicated that emotional and external eating do show some similarities in the variables associated with them, however, the pattern of associations were different for the two eating behaviours. It appears from this study that the theoretical distinction between emotional eating and external eating is warranted with emotional eating appearing to be directly associated with problems with affect regulation whereas external eating is indirectly associated with negative affect.

The Association between Alexithymia, Impulsivity and Negative Affect in Emotional and External Eating

Overview

Why and how people eat is more than a product of the nutritional content of food. With the increasing prevalence of obesity and disordered eating it has become important to understand the mechanisms behind eating. Emotional and external eating are two common eating styles that have been suggested as possible precursors to disordered eating and obesity (van Strien, 1996). External eating is the tendency to eat when exposed to food related cues, such as the sight, smell or taste of food, regardless of physiological hunger. Emotional eating is the tendency to increase food-intake when experiencing negative emotions. Emotional eating is seen as an unnatural response to distress. Emotional distress such as fear, apprehension and tension inhibits gastric mobility (Carlson, 1916) promotes the release of sugar into the bloodstream (Cannon, 1915) and consequently normally supresses hunger (Heatherton, Herman, & Polivy, 1991). Therefore, decreased eating is considered the natural biological response to distress (Schachter, Goldman, & Gordon, 1968). The concepts of emotional and external eating have been around for decades and have stimulated much research, however little is known about the underlying constructs of these eating styles.

Emotional and external eating are common eating behaviours in the general population. A survey conducted in Finland reported that 30% of women and 25% of men stated that at least occasionally they ate in order to cope with stress (Laitinen, Ek, & Sovio, 2002). Similar percentages were found in a representative survey in Germany (Pudel & Westenhöfer, 1993 as cited in Ogden, 2010).

While emotional and external eating are common, and to a degree normal eating behaviours, they lie on a continuum of disordered eating (Polivy & Herman, 1987) and can have negative consequences. Emotional eating may impede individuals in making healthy

lifestyle changes. Van de Laar et al. (2006) investigated emotional and external eating in a group of individuals newly diagnosed with type-II diabetes. Emotional and external eating was associated with higher intake of unhealthy foods at time of diagnosis and women who scored higher on emotional eating were less able to make necessary dietary changes after the diagnosis of type II diabetes. Emotional and external eating has been shown to be associated with difficulties adjusting to the changes needed after gastric banding surgery. Those that exhibited emotional or external eating were more likely to binge eat in the months and years following surgery (Larsen, Geenen et al., 2006).

In non-clinical populations emotional and external eating has been associated with difficulties in undertaking health behaviours. In a large group of employees emotional and external eating was negatively associated with physical activity (van Strien & Koenders, 2010). In addition, Konttinen, Silventoinen, Sarlio-Lähteenkorva, Männistö, and Haukkala (2010) reported that emotional eating was negatively associated with physical activity self-efficacy in a representative Finnish sample.

In the current obesogenic environment in which energy-dense food such as takeaways and fast food are easily available and with the proliferation of food advertising and food labelling, a tendency to be sensitive to external cues may cause poor food choices. Conner, Fitter, and Fletcher (1999) examined multiple moderators of the relationship between daily hassles and snacking. A tendency toward external eating appeared to be the key variable in the relationship between daily hassles and snacks consumed, reducing other moderators to non-significance. This suggests that when faced with stress external eaters may find it difficult to resist external food cues.

Emotional eating has been shown to be associated with higher consumption of energy-dense foods such as ice-cream, cake, chips and soda and a negative relationship with fruit and vegetable consumption in adolescents and young adults (de Lauzon et al., 2004;

Nguyen-Michel, Unger, & Spruijt-Metz, 2007), suggesting a predisposition to possible overweight and obesity in later life if these patterns continue.

Emotional and external eating may also lead to more severe disordered eating and eating disorders. Vanderlinden, Grave, Vandereychen, and Noorduin (2001) investigated factors that may trigger binge eating in female students. A large number of binge eaters reported emotional triggers as antecedents to binge eating. External cues were also reported as an antecedent to binge eating. In a two year prospective study emotional eating was found to be a predictor in the development of binge eating and obesity in adolescent girls (Stice, Presnell, & Spangler, 2002).

Many overweight, obese and disordered eating individuals do not start out that way. Therefore it is important to understand what contributes to eating behaviour in normal-weight populations as this research can further our understanding of the factors that contribute to obesity and disordered eating.

Emotional Eating

The concept of emotional eating was conceptualised by Bruch (1973) in her psychosomatic theory of eating and eating disorders. Central to this theory is the concept of interoceptive awareness. Interoceptive awareness is defined as sensitivity to stimuli originating within the body. Poor interoceptive awareness is associated with difficulties recognising whether one is hunger or satiated or suffering from discomfort and is also associated with difficulty recognising and identifying ones feelings (Bruch, 1973). Some people interpret the sensations of emotions as emptiness similar to hunger and food is used as a form of emotional comfort (Bruch, 1973). This overeating in response to distress puts the individual at risk of becoming obese (Bruch, 1973). It is thought that poor interoceptive awareness is an outcome of early learning experiences in which the child's needs were not meet (Bruch, 1973).

Emotional eating is also explained in a number of more recent theories; the masking hypothesis (Polivy & Herman, 1999) and escape theory (Heatherton & Baumeister, 1991). Masking theory hypothesises that overeating is an attempt to reduce perceived stress; by eating, distress is alleviated. In escape theory it is postulated that bingeing occurs as an attempt to escape from negative self-awareness. When individuals are confronted with ego-threatening information they shift their attention to the immediate stimulus environment and away from higher more meaningful levels of cognition, allowing them to avoid dealing with the implications of the threatening information. However, such narrowing of attention results in the removal of inhibitions creating a situation where individuals are likely to engage in binge eating. Therefore emotional eating is a response to escape/shift attention away from negative information about the self.

Another proposed mechanism of emotional eating suggests that overeating is a way of alleviating negative affect by increasing positive emotion. Individuals derive pleasure from the consumption of food either because of its qualities such as taste or odour (Lehman & Rodin, 1989) or because they enjoy eating a "banned" substance (Fairburn & Cooper, 1982). Studies have found that bingeing does temporarily improve mood (Deaver, Miltenberger, Smyth, Meidinger, & Crosby, 2003; Thayer, 2001), although research also suggests that overeating further increases negative mood (Sherwood, Crowther, Wills, & Ben-Porath, 2000).

The concept of emotional eating is commonly accepted; indeed the term "comfort food" is widely used in society. A tendency to eat when experiencing negative emotions has been shown in clinical populations (Polivy & Herman, 2002). Obese individuals, bulimics and restrained eaters often show increased food intake after having experienced negative emotions (Baucom & Aiken, 1981; Greeno & Wing, 1994; Ruderman, 1985; Schotte, Cools,

& McNally, 1990; Sherwood et al., 2000; Telch & Agras, 1996; van Strien & Ouwens, 2003; Wardle & Beales, 1988).

In addition to clinical populations emotional eating has been found in normal populations. The motivation to eat during negative emotions was demonstrated by Macht and Simons (2000). Female university students rated their emotional state and motivation to eat on six consecutive days at 11am, 2pm, 5pm, 8pm and 11pm. Self-rated motivation to eat was increased during periods of negative emotions. This study demonstrates increased motivation to eat when facing negative emotions however it does not show actual increased eating in response to negative emotions.

In a naturalistic diary study of university students O'Connor, Jones, Conner, McMillan, and Ferguson (2008) reported an increase in snacking and a decrease in fruit and vegetable consumption in emotional eaters. Ego-threatening, interpersonal and work related stress were most strongly related to the adoption of unhealthy eating habits.

A study by Oliver, Wardle, and Gibson (2000) examined eating in healthy men and women after a stress induction. The "stressed" group were asked to prepare a four minute speech that would be filmed and assessed, after a meal. The control group listened to a passage of neutral text before eating the meal. The meal included sweet, salty or bland high and low fat foods. Participants completed the Dutch Eating Behaviour Questionnaire (DEBQ) to assess emotional eating. In the stress condition the caloric intake of high emotional eaters intake was significantly greater than that of low emotional eaters.

Lowe and Maycock (1988) utilised the Velten mood induction procedure (Velten, 1968) to produce neutral or depressed moods in normal weight university students. In the depressed condition participants read a series of 45 increasingly depressing self-statements with instructions to try to induce in themselves the mood suggested by the statements. The neutral condition involved reading 45 bland descriptive statements. Participants were

encouraged to eat candy which was made available during the mood induction procedure. Participants in the depressed condition were found to eat the most candy suggesting emotional eating.

Although research has demonstrated emotional eating in normal samples other studies have reported decreased eating in response to negative emotions. For example, Kenardy, Butler, Carter, & Moor (2003) reported decreased eating in response to negative mood induction in a non-clinical university sample. Other studies have reported no effect of negative emotions in eating intake (Conner, Fritter, & Fletcher, 1999; Evers, de Ridder, & Adriaanse, 2009; Rotenberg & Flood, 1999; Ruderman, 1985).

Some of the null findings may be explained by the self-reporting of emotional eating and the type of food used to measure intake. It has been suggested that individuals may not be able to classify themselves as emotional eaters, because people may lack insight into their eating behaviour (Evers et al., 2009). In the study by Oliver et al. (2000) overall intake was not found to be affected by the stress induction but there was an increase in the consumption of energy-dense foods. Research suggests that emotional eaters are motivated to eat high-fat and sweet foods when experiencing negative affect which may not translate to increased overall intake but may translate to increased caloric intake (Bennett, Greene, & Schwartz-Barcott, 2013). In the study by Kenardy et al. (2003) which reported a decrease in energy intake in the negative mood group, the taste test utilised crackers. Crackers may have not been an appealing food choice to those experiencing negative emotions; preference may have been for high-fat or sweet foods. Furthermore, experimental studies lack ecological validity. A negative mood induced in the laboratory is possibly very different from the emotions experienced in reality. In addition, individuals may not feel comfortable overeating in front of the researcher.

The evidence for emotional eating in non-clinical populations appears mixed. A review of experimental studies investigating eating after experiencing negative emotions indicated that among normal, unrestrained individuals in 43% of studies participants ate more after experiencing negative affect, whereas in 39% of studies participants decreased food intake. In the remaining proportion of studies no significant change in eating behaviour was observed (Macht, 2008).

External Eating

The concept of external eating has its origin in the externality theory of obesity, developed by Schachter (Schachter, 1968). The original theory proposes that the obese are more stimulus bound and thus susceptible to external food cues, such as the sight, taste and smell of food. Eating is done in response to food related stimuli, regardless of the internal state of hunger.

The first studies of externality theory were focused on showing that obese individuals were less reliant on internal cues rather than showing that they were overly responsive to external cues. For example Goldman, Jaffa, and Schachter (1968) reported that heavier long-haul pilots were less disturbed by time-zone changes than were lighter pilots presumably because the heavier pilots were less connected to their internal state. However, demonstrating that heavier individuals are presumably less internally orientated than lighter individuals is not the same thing as demonstrating that they are more responsive to external cues. Given this limitation other studies set out to specifically test externality.

Nisbett (1968) found that manipulations of portion size had a significant effect on the amount of food obese individuals ate, whereas normal weight individuals ate the same amount irrespective of their initial portion size; implying that the sight of food can influence eating in obese individuals. Schachter and Gross (1968) found that manipulating a clock so that participants inaccurately thought that dinner time was approaching led obese participants

but not normal weight participants to increase their food intake. However, normal weight participants were also affected by the time manipulation, just in the opposite direction to the obese participants. Normal weight individuals ate less as their dinner time approached which was explained as not wanting to spoil their dinner. Although the effects were the opposite it is important to note that both weight groups were affected by the external cue.

A study by Nisbett and Storms (1974) also demonstrated that both obese and normal weight individuals are affected by external cues. Nisbett and Storms (1974) investigated social influence on eating, reasoning that the eating behaviour of one's eating partner is an external cue. Confederates in the study were instructed to either eat a lot or a little in the presence of the participants, whose food intake was recorded. The confederate's intake had an effect on all participants irrespective of their weight category; both obese and normal weight participants ate a lot when the confederate ate a lot and a little when the confederate ate a little. This research challenged Schachter's original conception of externality theory that emphasized the obese-normal weight distinction. However, in support of the original externality theory it can be argued that to some degree external cues can affect anybody but obese individuals are also less responsive to internal cues such as hunger.

Similarly Rodin (1981) challenged externality theory. Rodin (1981) argued that external responsiveness may be found in all weight categories and absent responsiveness to internal cues may also be found in all weight categories. Moreover, she argued the distinction between external and internal cues is not as distinct as Schachter proposes; they may interact to produce overeating. External cues may affect eating through the mediation of internal cues and one's motivational state may affect responsiveness to external cues.

This has been demonstrated by Kauffman, Herman, and Polivy (1995). Motivational state was manipulated by food deprivation. Food deprived participants should be more motivated to eat. Normal weight hungry participants became more responsive to the

palatability of available food, by eating more good tasting food and less bad tasting food. Similarly, Goldman, Herman, and Polivy (1991) manipulated confederates food intake in the presence of either food deprived or non-food deprived participants, similar to Nisbett and Storms design. If external cues were not exerting an influence food deprived participants would eat just as much regardless if the confederate was eating a lot or a little. However, Goldman et al. (1991) reported that participants who had been food deprived for 24 hours were just as responsive to the confederates intake as participants who were not food deprived.

Research appears to suggest that responsiveness to external food cues or externality may not be exclusive to obese individuals, but can be seen in all weight categories. Following this line of thinking externality could be considered an individual difference variable in eating behaviour. Body weight depends on physiological variables and genetic predisposition therefore comparing individuals on the basis of weight may not provide a full understanding of eating patterns. Furthermore, body weight can be controlled through dieting. Assessing individual differences in eating behaviour may provide more understanding of eating patterns than comparing normal-weight and obese individuals.

Externality can be related to recent neurocognitive models of normal and pathological motivational states. Neurocognitive motivational models theorise that specialised brain systems control cognitive and behavioural responses to motivationally salient stimuli. For example Gray (1987) proposed that approach behaviours are controlled by the Behavioural Activation System which is activated by cues of reward and guides the individual towards appetitive stimuli. According to Berridge (2007) an integrated network of neural systems determines the reward or incentive value of motivationally salient external cues (e.g. sight of food or drugs). Activation of such reward systems elicits a range of subjective, cognitive and behavioural responses, such as a preferential allocation of attention to food. Moreover, individual differences in the responsiveness of this motivational system to external cues of

reward (e.g. food) may be important in determining vulnerability to developing obesity (Berridge, 2007). Thus individuals whose reward system is hypersensitive to food cues may have an increase vulnerability to overeating and obesity.

Following recent neurocognitive theories if the concept of externality exists and thus external eating, individuals who report being external eaters should show attention bias toward food. Findings have supported this hypothesis with reported external eaters showing an increased tendency to attend to food cues (Brignell, Griffiths, Bradley, & Mogg, 2009; Hepworth, Mogg, Brignell, & Bradley, 2010; Hou et al., 2011; Nijs, Franken, & Muris, 2009). These studies utilising university students as participants used the pictorial version of the visual probe task, which presents a pair of pictures (e.g. food and non-food pictures), each pair is followed by a probe stimulus in the place of one of the pictures to which participants rapidly respond too. The results of these studies showed that high external eating was associated with faster detection of probes replacing food than non-food cues, indicating a greater attentional bias for external food cues in external eaters.

Emotional and External Eating, Energy Intake and Weight

It is proposed that different eating styles may lead to different patterns of energy intake (Anschutz, van Strien, Van De Ven, & Engels, 2009). Energy intake has been primarily studied in relation to restrained eating. However, some studies have begun to investigate the association between emotional and external eating and food intake. In a study of female university students Anschutz et al. (2009) reported that external eating was associated with higher levels of energy intake, especially fat; emotional eating was not related to energy intake. Wardle et al. (1992) reported similar findings with external eating related to higher energy intake in restrained eaters; emotional eating was not related to energy intake. Results from the Stanislas Family Study, which used three day food consumption diaries to monitor energy intake showed that external eating was associated with higher energy intake

whereas no relation was found between emotional eating and energy intake (Lluch, Herberth, Mejean, & Siest, 2000). Although in the few studies that have investigated emotional eating and food intake no associations have been found, this does not mean that emotional eating is not associated with increased energy intake. In the study by Anschutz et al. (2009) energy intake was measured retrospectively using the Food Frequency Questionnaire, with participants having to recall the frequency in which they consumed 145 food items over the previous 28-day period. This method is subject to recall and self-report bias. There is evidence that retrospective measures are prone to the underreporting of caloric intake (Stice, Fisher, & Lowe, 2004). For example, Klesges, Isbell, and Klesges (1992) showed that one third of people in a national sample reported caloric intakes that would result in death by starvation.

Daily food diaries like those used in the Stanislas Family Study may not capture energy intake associated with emotional eating. Emotional eating occurs when the individual is feeling distress; the Stanislas Family Study only had participants record energy intake for three days; three days may not be a long enough period to assess energy intake in relation to psychological distress.

The suggested increased energy intake in emotional and external eaters puts forward the idea that emotional and external eaters have an increased risk of high body mass index (BMI). Furthermore, psychosomatic and externality theory were initially proposed to explain the eating behaviour of the obese. Therefore a positive relationship between increased BMI and emotional and external eating is expected. However, results have been inconsistent. Research in overweight and obese populations has found elevated emotional and external eating compared to healthy weight individuals (de Lauzon-Guillain et al., 2006; Konttinen, Haukkala, Sarlio-Lähteenkorva, Silventoinen, & Jousilahti, 2009; van Strien, Herman, & Verheijden, 2009). Heaven, Mulligan, Merrilees, Woods, and Fairooz (2001) reported a

positive correlation between emotional and external and BMI in university students. Van Strien, Herman and Verheijden (2012) conducted a prospective study with a two-year follow-up in a representative Dutch sample. Changes in BMI were assessed in relation to emotional and external eating. Emotional and external eating moderated the relation between overeating and BMI change. Although external eating was associated with weight gain, it was emotional eating that was related to meaningful weight gain as assessed as greater than 3%. Other studies have found no relationship between emotional and external eating and BMI (Anschutz et al., 2009; van Strien et al., 2009; Wardle et al., 1992). To explain why emotional and external eating has not been consistently associated with increased BMI, dietary restraint has been proposed to moderate the relationship between overweight and emotional and external eating (van Strien et al., 2009). In other words individuals who engage in emotional and external eating may engage in restrained eating to negate weight gain; therefore, emotional and external eating can be found in all weight categories. Furthermore as previously discussed, research has demonstrated that emotional and external eating do not always correlate with increased energy intake (Anschutz et al., 2009). However, long term emotional and external eating may lead to increased weight (van Strien et al., 2012), with the occasional emotional eating episode possibly not leading to increased weight.

The Relationship between Emotional and External Eating

There has been debate on whether emotional and external are distinct constructs. Research shows that emotional and external eating are highly correlated with some studies showing correlations as high as .50 (Wardle, 1987). Psychosomatic theory and externality theory share some commonalties. Common to both psychosomatic theory and externality theory is that individuals are unresponsive to internal physiological signals of hunger and satiety. In contrast, in emotional eating theory emphasis is placed on internal emotional states whereas external eating focuses on the external environment as a determinant of eating

behaviour. Other research supports that there are different correlates to emotional and external eating, implying that they are different constructs.

Slochower (1983) proposed that emotionality and food cues operate conjointly to elicit eating behaviour. Negative affect may enhance reactions to external cues. Research has shown that external eaters show a bias to food cues when under stress (Newman, O'Connor, & Conner, 2008). A high degree of emotionality is seen as one of the aspects of externality (Schachter & Rodin, 1974).

Although emotional and external eating tend to co-occur and share some theoretical similarities, particularly the role of negative emotions inducing responses; however, research suggests that they are independent constructs and may be manifested independently (van Strien, Schippers, & Cox, 1995). O'Connor and O'Connor (2004) studied perfectionism and conscientiousness in relation to emotional and external eating. Perfectionism was not related to either emotional or external eating. Conscientiousness was related to external eating only, showing a negative relationship. This suggests possible different underlying constructs of emotional and external eating.

Through structural equation modelling Ouwens, van Strien and, van Leeuwe (2009) showed that there are distinct pathways toward emotional and external eating. Depression had a direct relationship with emotional eating whereas depression was mediated by impulse regulation for external eating. Difficulty identifying feelings was related to emotional eating but not external eating.

Van Strien et al. (1995) set out to investigate the distinction between emotional and external eating. The relationships between emotional and external eating and addictive behaviours and emotional problems were examined. Participants were female undergraduate students and completed the DEBQ and the Problem History Questionnaire (PHQ). The PHQ measures addictive behaviours and emotional problems, such as substance use, gambling,

eating disorders, relationship and sexual problems and emotional disturbances. Based on a principal components analysis of the PHQ items a four factor solution of problem behaviours was used for further analysis. The four factors were 1) emotional and relationship problems, which included phobias, depression, anxiety, suicide, problems with relationships and problems with sex; 2) stimulus-boundness - problems with working, leisure activities, spending money and exercise; 3) eating problems - binge eating, obesity and anorexia and 4) substance use problems - problems with nicotine, caffeine and alcohol. Not surprisingly both emotional and external eating was associated with the eating problems cluster. However, only emotional eating was associated with the problems with emotions and relationships cluster. This finding is consistent with earlier findings that emotional eating is associated with emotional and social problems in women with previous research showing an association between emotional eating and feelings of inadequacy, low self-esteem, low sociability and social anxiety (van Strien, Frijters, Roosen, Knuiman-Hijl, & Defares, 1985; van Strien & Bergers, 1988). These findings indicate that emotional eating is associated with emotional problems whereas external eating is not, suggesting that the two types of eating behaviours reflect different constructs.

In contrast Heaven et al. (2001) studied emotional and external eating in relation to the Big Five Personality Traits in undergraduate students. The results suggested that emotional and external eating load on the same factor with both eating behaviours being significantly related to high neuroticism and low conscientiousness. Elfhag and Morey (2008) reported similar findings in a sample of obese individuals. Emotional and external eating was associated with high neuroticism and low conscientiousness although for external eating the correlations were weaker. Slight differences emerged when the facets of neuroticism and conscientiousness were examined. Emotional eating was associated with the facets impulsivity and depression, whereas external eating was only associated with impulsiveness.

There was no difference in the associations with the conscientiousness domain, with both eating behaviours being associated with the facet self-discipline. Although these studies suggest similar underlying psychological constructs of emotional and external eating there are very few studies examining the personality correlates of emotional and external eating, therefore conclusions can only be tentative. Given this limited research, further research into the personality traits associated with emotional and external eating is needed as it could distinguish these concepts from each other and be helpful in understanding more about their nature.

Impulsivity

Impulsivity colloquially refers to a tendency to act on the spur of the moment, with a lack of planning and forethought about the consequences of immediate actions (Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001). Impulsivity has been associated with an increased risk for engaging in risky health behaviours, including tobacco use (Barker, Brandon, & Chassin, 2004; Billieux, Van der Linden, & Ceschi, 2007), alcohol use (Stautz & Copper, 2013) and gambling (Slutske, Caspi, Moffit, & Poulton, 2005). Research suggests that impulsivity is a general factor that increases risk for engaging in risky health behaviours, without specifically predisposing an individual toward any particular health-risk behaviour and is an important trait in a common pathway to addictive behaviours (Chambers & Potenza, 2003).

Agreement exists that impulsivity is a risk factor for unhealthy behaviours, however there is less agreement on the underlying nature of impulsivity. Impulsivity is present in every model of personality in one way or another (e.g. Eysenck & Eysenck, 1977; Cloninger, Przybeck, & Svrakic, 1991). Furthermore, impulsivity has been given many names by various researchers: for example, rash impulsiveness, lack of control, lack of deliberation, sensation seeking, novelty seeking, lack of self-discipline and venturesomeness (Miller, Flory, Lynam,

& Leukefeld, 2003). Because of the different conceptualisations and measurement of impulsivity there has been difficulty interpreting and synthesising research findings. Although, there is no consensus on the exact nature of impulsivity it is widely recognised that impulsivity is a multidimensional construct (Waxman, 2009), with multiple varieties of impulsivity that are independent of each other.

In an attempt to add clarity to the range of impulsivity measures and theories, Whiteside and Lynam (2001) attempted to identify facets of impulsivity that were common across impulsivity measures and place them in a broad model of personality. Whiteside and Lynam (2001) used the Five-Factor Model of personality (FFM; McCrae & Costa, 1990) to provide the framework to understand the dimensions of impulsivity.

The FFM consists of five broad higher-order factors called domains, which include neuroticism, extraversion, openness to experience, agreeableness and conscientiousness. Each domain is made up of six sub-factors called facets. An overview of the FFM is presented in Table 1.

Table 1

Overview of the Domains and Facets of the Five Factor Model of Personality

	Domains				
	Extraversion	**Agreeableness**	**Conscientiousness**	**Neuroticism**	**Openness to Experience**
Facets	Warmth	Trust	Competence	Anxiety	Fantasy
	Gregariousness	Straightforwardness	Order	Hostility	Aesthetics
	Assertiveness	Altruism	Dutifulness	Depression	Feelings
	Activity	Compliance	Achievement Striving	Self-Consciousness	Actions
	Excitement Seeking	Modesty	Self-Discipline	Impulsiveness	Ideas
	Positive Emotion	Tender-Mindedness	Deliberation	Vulnerability	Values

Adapted from "An Introduction to the Five-Factor Model and its Applications", by R. R. McCrae and O. P. John, 1992, *Journal of Personality, 60*, p. 178-179.

Whiteside and Lynam (2001) proposed that there were four distinct facets on three domains of the FFM that capture some aspect of impulsivity; excitement seeking on the extraversion domain, self-discipline and deliberation on the conscientiousness domain and impulsiveness on the neuroticism domain. The FFM is consistent with previous conceptualisations of impulsivity. Costa and McCrae (1992) stated that low self-control is measured by the impulsiveness facet of the neuroticism domain and by the self-discipline facet of the conscientiousness domain. In addition, the other two facets that Whiteside and Lynam (2001) suggest capture impulsivity are conceptualised by other investigators. The excitement seeking facet of extraversion is similar to the dimension of sensation seeking of Zuckerman (1994) and the venturesomeness of Eysenck and Eysenck (1977). Deliberation is comparable to Tellegen's control scale (Tellegen, 1982) and to Barratt's non-planning factor (Patton, Stanford, & Barratt, 1995). Therefore, the FFM offers four distinct conceptualisations of impulsivity.

Using factor analysis on seven frequently used self-report measures of impulsivity Whiteside and Lynam (2001) derived four dimensions with each dimension showing a different pattern of association with the higher order domains and facets of the FFM; Urgency (Neuroticism/Impulsiveness), Lack of Perseverance (Conscientiousness /Self-Discipline), Lack of Premeditation (Conscientiousness /Deliberation) and Sensation Seeking (Extraversion/Excitement Seeking). From this work the UPPS Impulsive Behavior Scale was developed which includes four subscales derived from the factor analysis to assess each dimension of impulsivity (Whiteside & Lynam, 2001).

The impulsivity model proposed by Whiteside and Lynam (2001) suggests that different processes may be involved in degrees of the same behaviour. For example drinking alcohol, an individual may be high in sensation seeking and low in urgency thus this individual may be experimenting and the chance of problem drinking may be lower than

someone who is lower in sensation seeking but high in urgency, where alcohol consumption may become a problem because they drink to cope with negative affect.

The impulsivity model proposed by Whiteside and Lynam (2001) and the UPPS Impulsive Behavior Scale have been shown to be reliable and have received empirical support for its predictions of the relationship between different aspects of impulsivity and psychopathology. Miller et al. (2003) studied a sample of 481 students in order to provide validation for the UPPS model. Lack of premeditation was consistently the strongest correlate of externalizing problems, suggesting that those with externalizing problems may lack forethought. Urgency appeared to be more strongly related to forms of psychopathology that are characteristic of problems with affect, such as personality disorders, eating disorders and depression. Depression was also related to lack of perseverance. However, lack of perseverance may be related to depression because depressed individuals may have a difficult time persisting in their duties because depression tends to interfere with one's motivation.

Smith et al. (2007) provided additional support for Whiteside and Lynam's (2001) model and its clinical utility. In a set of three studies Smith et al. (2007) repeatedly found support for the four factor structure described by Whiteside and Lynam (2001), using different assessment methods. In study one the UPPS Impulsive Behavior Scale was used, in studies two and three a semi-structured interview was developed and conducted in addition to the UPPS Impulsive Behavior Scale. Utilising different assessment methods and finding the same factor structure strengthens the validity of the model. Smith et al. (2007) reported similar findings to Miller et al. (2003) for the associations between the impulsivity dimensions and behaviour with different dimensions being related to different behaviours. Sensation seeking was related to the frequency of taking part in risky behaviour, whereas urgency was related to engaging in behaviours such as problem drinking, pathological gambling and binge eating. Sensation seeking thus appeared to be related to taking part in

new exciting activities whereas urgency appeared to be related to taking part in maladaptive behaviours when upset.

Impulsivity and Eating Behaviour

Research has demonstrated that there is a positive association between impulsivity and eating pathology. Although the different operationalizations of impulsivity has made comparisons between studies difficult. Given the multidimensional nature of impulsivity there is little clarification regarding which subtype of impulsivity is most reliably associated with eating behaviour. The majority of research on impulsivity and eating has focussed on eating disorders and clinical populations such as obese individuals. The association between impulsivity and normal eating behaviour and non-clinical individuals has largely been neglected, limiting the ability to draw conclusions regarding the role impulsivity plays in eating behaviour.

It is proposed that impulsivity may be related to eating behaviour through an underlying reward deficit syndrome (Dawe & Loxton, 2004; Volkow, Fowler, Wang, & Goldstein, 2002). Food may increase the release of dopamine in the neural reward circuits which increases motivated behaviour (Volkow et al., 2002). Eating when upset was found to be associated with a hypo-function of dopamine-related reward systems in the dorsal striatum of the brain. This finding suggests that negative emotion may elicit food consumption to dull the effect of dopamine related deficits (Volkow et al., 2003). A reward deficit syndrome has also been held responsible for abuse of alcohol and other drugs and proneness to impulsive, reckless and destructive behaviours (Dawe & Loxton, 2004).

Within the field of eating behaviours some important findings between impulsivity and eating have been uncovered. Impulsivity has been shown to be significantly higher among women with binge-spectrum eating disorders such as bulimia nervosa and anorexia nervosa binge-purge subtype (Claes, Nederkoorn, Vandereycken, Guerrieri, & Vertommen,

2006; DaCosta & Halmi, 1992; Rosval et al., 2006; Steiger & Bruce, 2007; Steiger, Lehoux, & Gauvin, 1999). Furthermore, research has indicated that impulsivity is significantly related to binge eating (Fischer, Smith, & Cyders, 2008; Nasser, Gluck, & Geliebter, 2004; Steiger et al., 1999). Impulsivity has also been identified as a trait in obese individuals and is suggested as a factor that contributes to weight gain and obesity (Nederkoorn, Smulders, Havermans, Roefs, & Jansen, 2006).

While less is known about the role of impulsivity in eating behaviour in non-clinical samples, the available research suggests that impulsivity affects eating attitudes and behaviours in non-clinical populations as impulsivity may impact on choices and actions related to food. Lyke and Spinella (2004) investigated impulsivity and eating in a non-clinical sample. The eating behaviours cognitive restraint, disinhibition and hunger were examined. Cognitive restraint is the thought or cognition involved in eating behaviour. Disinhibition is the loss of control over eating. Lastly, hunger is the level of desire for food experienced by the individual. Theoretically for both eating-disordered and normal populations eating is a function of these three eating behaviours (Stunkard & Messick, 1985). For example, binge eating is related to disinhibition (de Zwaan et al., 1994) whereas dietary restriction is associated more with cognitive restraint. The model of impulsivity proposed by Patton et al. (1995) was used to identify the types of impulsivity related to eating behaviour. In this model three distinct types of impulsivity are proposed non-planning, motor impulsivity and attentional impulsivity. Non-planning impulsivity involves attitudes and behaviours precipitated by a lack of reflection or forethought. Motor impulsivity reflects hyperactivity due to the need for movement. Attentional impulsivity refers to rapid shifts in attention. Lyke and Spinella (2004) reported that disinhibition positively correlated with both attentional impulsivity and motor impulsivity, suggesting that shifts of attention and the need for activity are associated with loss of control over eating. Hunger positively correlated with attentional

impulsivity, suggesting that desire for food is associated with attention shifts possibly toward food stimuli. Cognitive restraint did not correlate with any type of impulsivity. Restraint could be inversely related to impulsivity, as it requires persistence, thought and planning. However, restraint has been associated with disinhibition and binge eating (Herman & Mack, 1975; Wardle & Beales, 1988). Therefore, prolonged dietary restraint may give way to impulsive actions through disinhibited eating. Non-planning impulsivity did not correlate with any aspect of eating.

Yeomans, Leitch, and Mobini (2008) reported similar results to Lyke and Spinella (2004) in a non-clinical sample. Restraint was again found not be associated with impulsivity. Disinhibition positively correlated with motor impulsivity, however in contrast to Lyke and Spinella's (2004) result non-planning was significantly related to disinhibition. Not planning meals or grocery shopping may make it easier for some individuals to overeat and eat unhealthy, since healthy food choices may not be readily available when the need to eat arises. Together these results from Lyke and Spinella (2004) and Yeomans et al. (2008) suggest that in addition to the reported relationship between impulsivity and clinically defined eating disorders and obesity, impulsivity is also related to eating in normal weight individuals with non-clinically defined eating problems and different aspects of impulsivity may be associated with different eating behaviours.

Evidence also suggests that impulsivity may also be associated with the eating behaviours emotional and external eating in non-clinical populations. Guerrieri, Nederkoorn, and Jansen (2007) demonstrated that impulsivity may be related to external eating by varying the food environment in a sample of undergraduate students. The food environment was manipulated by presenting a bowl of "sugar beans" to participants under the guise of a taste test. For the variety group the bowl contained 14 different colours of sugar beans, the unvaried group were presented with an equal amount only containing plain white beans.

Individuals high in impulsivity consumed more sugar beans when in the varied food environment. The results of this study suggest that the presence of appealing food stimuli could induce desire to eat in those sensitive to external food cues, and those that are impulsive may have a hard time resisting food stimuli.

Hou et al. (2011) specifically studied the relationship between external eating, impulsivity and attentional bias to food cues. External eating showed a strong positive relationship with impulsivity. Furthermore, attentional bias toward food cues was significantly related to impulsivity. These findings suggest that impulsive individuals are likely to allocate attention to food-reward stimuli than non-impulsive individuals, which may induce eating.

Similar results were reported by Jasinska et al. (2012) in a sample of undergraduate students who had BMI's ranging from underweight to obese. The association between impulsivity, emotional and external eating were examined. External and emotional eating was associated with attentional impulsiveness, motor impulsiveness and non-planning impulsiveness. Jasinska et al. (2012) also examined the association of inhibitory control and emotional and external eating, by utilising the Go/NoGo task. The Go/NoGo task is a common method of measuring inhibitory control, with poor inhibitory control indicated by the number of false alarms on NoGo trails. The Go/NoGo task involves the participant performing an action (e.g. pressing a button) when given a certain stimuli (Go trails) and not performing that action (inhibiting response) when given a different set of stimuli (NoGo trails). Impairments in inhibitory control are thought to contribute to impulsivity (Logan, Schachar, & Tannock, 1997). Inhibitory control is defined as the ability to stop or supress responses that are not required or are inappropriate (Logan et al., 2009). Impairments in inhibitory control were associated with emotional eating. No relationships between external eating and inhibitory control were found, implying that emotional eaters but not external

eaters may have trouble suppressing the urge to eat or stop eating when upset; although general impulsivity was still related to external eating.

In addition to examining the associations between impulsivity, inhibitory control, emotional and external eating Jasinska et al. (2012) investigated the role of impulsivity in food choice. To assess food choice the Food Choice task (Hare, Camerer, & Rangel, 2009) was employed. The task included three blocks: decision block, taste rating block and healthiness rating block. On each trail one food item was presented in the middle of the screen with a block specific question above the image and a block specific response scale below the image. In the decision block the question asked "How much do you want to eat it?" with the response scale Strong No, No, Yes or Strong Yes. In the taste rating block participants were asked "How tasty is it?", Very Tasty, Tasty, Untasty or Very Untasty. For the healthiness rating block participants were asked "How healthy is it?", Very Healthy, Healthy, Unhealthy or Very Unhealthy. These subjective ratings were then used to classify all food items into four categories at the individual level: Tasty-Healthy, Tasty-Unhealthy, Untasty-Healthy and Untasty-Unhealthy. Participants who were high in impulsivity were more likely to endorse wanting to eat foods in the decision block that were Tasty-Unhealthy, suggesting that impulsive individuals may have trouble making healthy food choices.

The results of these studies provide evidence that impulsivity is not only related to the eating behaviour in eating disorder and obese populations but also may be an important trait in eating behaviour in general. Furthermore, these studies provide support for research that has been conducted in clinical populations. While disinhibition, hunger, emotional and external eating are all relatively normal dimensions of behaviour, they can lead to overeating, obesity and eating pathology (Vanderlinden et al., 2001). The findings that impulsivity is associated with these types of eating behaviour in normal-weight non-clinical samples suggest a pathway toward disordered eating and obesity.

The results by Heaven et al. (2001) and Elfhag and Morey (2008) investigating emotional and external eating and FFM provides suggestions as to which impulsivity dimensions from the UPPS model may be related to emotional and external eating. Emotional and external eating were related to higher neuroticism and lower conscientiousness. Negative emotionality or neuroticism and impulsivity have been proposed as central personality traits in eating behaviour (Lilenfeld, Wonderlich, Riso, Crosby, & Mitchell, 2006; Stice, 2002). Furthermore, in terms of the Whiteside and Lynam (2001) UPPS model, it would be expected that emotional and external eaters would score high on the Urgency, lack of perseverance and lack of premeditation factors; as these factors related to the higher order dimensions of the FFM neuroticism and conscientiousness. It is hypothesised that urgency contributes the most to eating behaviour because it integrates emotionality and impulsivity (Fisher et al., 2008).

Lack of perseverance could be related to eating through negative affect. Lack of perseverance was found to be related to depression by Miller et al. (2003). Depression is often found in those with eating disorders and eating pathology (Lewinsohn, Striegel-Moore, & Seeley, 2000). Moreover, depression has been found to be associated with emotional and external eating (Konttinen et al., 2010); therefore it is possible that a lack of ability to persist in activities is due to depression secondary to eating behaviour.

From previous research it is unclear whether lack of premeditation is related to eating behaviour. Fischer et al. (2008) found no association between bulimic symptoms and lack of premeditation, whereas Claes, Vandereycken, and Vertommen (2005) reported that lack of premeditation was associated with BN patients. The differences in findings could be due to the differences in the samples. Fischer et al. (2008) investigated bulimic symptoms in non-clinical university students whereas Claes et al.'s (2005) sample consisted of eating disorder patients. Additionally, Lyke and Spinella, (2004) reported that non-planning impulsivity was also not related to eating behaviour in their non-clinical sample. Furthermore, when the facets

of conscientiousness were investigated in Elfhag and Morey's (2008) study it was the facet of self-discipline that was the most strongly related to emotional and external eating. Lack of premeditation is based on the conscientiousness facet of deliberation whereas lack of perseverance is based on the self-discipline facet.

Alexithymia

The alexithymia construct first evolved from clinical observations on patients suffering from classical psychosomatic diseases. For many years the psychic disturbance in these patients was conceptualized according to Freud's model of psychoneurotic pathology.

However, some early leaders in psychosomatic medicine believed that psychosomatic diseases could not be explained by the psychoneurotic model. Through their clinical observations it was suggested that it is a disturbance in the cognitive processing of emotions, rather than intrapsychic conflict that predisposes some individuals to psychosomatic illness. For example, MacLean (1949) noted that many psychosomatic patients showed an apparent inability to verbalize feelings. Similarly, Ruesch (1948) observed a disturbance in verbal and symbolic expression among psychosomatic patients and patients with post-traumatic syndromes. Ruesch (1948) also observed that his patients were unimaginative, used direct physical action for emotional expression, failed to use affect as signals and showed an excessive degree of social conformity.

Horney (1952) and Kelman (1952) also described similar characteristics in patients who showed a poor response to psychoanalytic treatment. The poor response to psychoanalysis was said to be due to a lack of emotional awareness, minimal interest in dreams and a concrete and externalized thinking style. These patients were also prone to engaging in binge eating, alcohol abuse and other dysregulated behaviours apparently to avoid experiencing feelings of inner emptiness (Horney, 1952; Kelman, 1952).

Despite these early observations it was not until the early 1970s that the alexithymia construct began to be systematically investigated by pioneers Sifneos and Nemiah who studied the cognitive and affective style of patients suffering from classical psychosomatic diseases. The term alexithymia was first coined by Sifneos (1973), literally meaning "no words for feelings". Sifneos (1973) defined the alexithymia construct as having four salient features 1) difficulty identifying and describing subjective feelings 2) difficulty distinguishing between feelings and the bodily sensations of emotional arousal 3) limited capacity for imagining and fantasising and 4) an externally orientated cognitive style.

Sifneos and Nemiah's research spurred widespread interest in researching alexithymia. The results of their and other researchers' studies confirmed that many patients suffering from classical psychosomatic diseases have marked difficulty describing subjective feelings. Alexithymic individuals are unable to elaborate their feelings beyond limited adjectives such as "happy" or "sad" when asked to describe their feelings. Alexithymic individuals may also respond to questioning about their feelings with descriptions of the physical symptoms. Furthermore these patients were shown to have a communicative style with a preoccupation with minute details of events and a lack or absence of fantasies; alexithymic individuals are unable to cognitively process their emotions through fantasy and imagination. Although these early studies provided support for the alexithymia construct, many of these studies are of questionable validity and generalizability.

These studies were conducted before the validity of the alexithymia construct was established and used measures that lacked validity and reliability (Taylor, Bagby, & Parker, 1997). The development of the Toronto Alexithymia Scale (TAS) and the subsequent Twenty-Item Toronto Alexithymia Scale (TAS-20) has provided a valid and reliable way of measuring alexithymia. The TAS-20 comprises three subscales to measure the different factors of the alexithymia construct; difficulty identifying feelings, difficulty describing

feelings and externally orientated thinking. The TAS-20 is the most widely used measure of alexithymia, and has shown validity and reliability in clinical and non-clinical samples (Bagby, Parker, & Taylor, 1994; Bagby, Taylor, & Parker, 1994; Parker, Taylor, & Bagby, 2003). Furthermore, the TAS-20 has been cross-validated in many cultures, including Hindi (Pandey, Mandal, Taylor, & Parker, 1996), Korean (Lee, Rim, & Lee, 1996), Italian (Bressi et al., 1996) and Lithuanian (Beresnevaitc, Taylor, Parker, & Andziulis, 1998).

These days alexithymia is considered to be a personality trait that is normally distributed in the population (Taylor et al., 1997). Prevalence of alexithymia differs by the population under study. Prevalence estimates for non-clinical populations range from 10 – 15% (Parker, Taylor, & Bagby, 1989; Rybakowski, Ziolkówski, Zasadzka, & Brzeziński, 1988; Salminen, Saarijävi, Äärelä, Toikka, & Kauhanen, 1999). For clinical populations prevalence estimates vary but are usually reported to be over 50%. For example 53% has been reported in somatoform disorders (Cox, Kuch, Parker, Shulman, & Evans, 1994), 62.5% for binge eating disorder (BED) (Pinaquy, Chabrol, Simon, Louvet, & Barbe, 2003) and 45% - 67% for alcohol use disorders (Thorberg, Young, Sullivan, & Lyvers, 2009).

The growing body of alexithymia research has associated alexithymia with a variety of medical and psychiatric illnesses and problematic behaviours including posttraumatic stress disorder, pathological gambling, self-injury, substance use disorders, somatoform disorders, hypertension, inflammatory bowel disease, functional dyspepsia and eating disorders (Frewen, Dozois, Neufeld, & Lanius, 2008; Porcelli et al., 2003; Taylor et al., 1997).

Little is known of the causes of alexithymia, although several factors have been proposed such as attachment style, early learning experiences and biological vulnerabilities. Early developmental deficiencies have been a popular cause of alexithymia proposed by psychoanalytic theorists, since the development of affect and affect regulation occurs early in

life. Caregiver and child interaction in early childhood influence the development of emotion schemas, imagination and cognitive skills involved in affect regulations, through being taught to name and talk about feelings and the mirroring of affect.

A number of studies have shown that when the primary caregiver is emotionally unavailable or the child receives inconsistent responses the child is likely to develop an insecure attachment style and problems in affect development and regulation such as failing to learn the meaning and signals of affect and therefore becomes less emotionally expressive (Cassidy, 1994; Slade & Aber, 1992). There are no longitudinal studies of alexithymia following infants into adulthood; however, studies have been conducted with adults. These studies found that alexithymia in adulthood are associated with insecure adult attachment (Montebarocci, Codispoti, Baldaro, & Rossi, 2004; Scheidt et al., 1999; Troisi, D'Argenio, Peracchio, & Petti, 2001). Although these studies suggest that attachment style is associated with the development of alexithymia, they are limited in that they utilise self-report to classify current attachment styles and cannot point to causality. However, a 20 year longitudinal study found that 72% of young adults had the same attachment classification they had as infants; if attachment classification had changed it was often due to traumatic events (Waters, Merrick, Treboux, Crowell, & Albersheim, 2000). Another limitation of these studies is that they were conducted in clinical populations limiting the generalizability to general populations. For example, Scheidt et al. (1999) studied patients with idiopathic spasmodic torticollis and Troisi et al. (2001) studied young men with mood disorders.

Findings show high rates of alexithymia in individuals that had caregivers who restricted emotional expression. A study utilising undergraduate university students asked participants to retrospectively recall emotional expressiveness and feelings of safety in their family environment, using the expressiveness subscale of the family environment scale and the childhood experiences questionnaire (Berenbaum & James, 1994). Higher levels of

alexithymia were associated with family environments in which emotions were not permitted to be directly expressed and not feeling emotionally safe during childhood. However the data collected was retrospective accounts of childhood experiences and thus subject to bias.

A prospective study from Finland has provided some evidence for childhood factors that may be associated with adult alexithymia. The Northern Finland Birth Cohort Project collected data from 12,058 children born during 1966. The TAS-20 was administered to 5,983 individuals at the 31 year follow-up, 5,028 (84%) individuals returned the TAS-20 properly completed. This study found that alexithymia in adulthood was associated with being an unwanted child and being born into a family with many children (Joukamaa et al., 2003).

Since Sifneos' formulation of the alexithymia construct there has been interest in uncovering the neural correlates of alexithymia. Speculation that abnormal pathways in the brain were responsible for alexithymia had been proposed as early as 1949 when MacLean (1949) developed his model of a "triune brain" implicating the neocortex. Early research investigating neurobiological correlates mainly involved observations of split-brain patients or a tactile finger localization task to assess the efficiency of interhemispheric transfer in people with intact brains. Results suggested that alexithymia is associated with reduced coordination and integration between the two cerebral hemispheres (Taylor & Bagby, 2004). Childhood attachment and experiences also gives clues to biological factors related to alexithymia. Interactions between caregivers and their infants may influence the development of the orbitofrontal cortex, a part of the brain involved in emotional awareness and emotion regulation (Schore, 1996). Advances in brain imaging techniques have allowed more in-depth study of the brain regions associated with the emotion processing deficits of alexithymia.

Several studies have pointed to a deficit in activity in the anterior cingulate cortex (ACC). A functional magnetic resonance imaging (fMRI) study assessed brain activation

during viewing of emotion inducing pictures (Berthoz et al., 2002). Alexithymia was associated with differences in activity in the anterior cingulate and mediofrontal cortices. In a positron emission tomography (PET) study with healthy university graduates the TAS-20 total scores correlated with the size of the normalized surface area of the right ACC after controlling for age, gender and depression (Gündel et al., 2004). Karlsson, Näätänen, and Stenman (2008) also reported reduced activity in the ACC in alexithymic women compared with healthy women, after viewing neutral, amusing or sad videos.

Sifneos (1973) proposed that alexithymic individuals have impairments in the cognitive processing of emotions. Research has confirmed this with several studies providing evidence that alexithymia is associated with impairments in the automatic emotion processing (Vermeulen, Luminet, & Corneille, 2006), deficiencies in accessing emotional stimuli (Luminet, Vermeulen, Demaret, Taylor, & Bagby, 2006) and impairments in perceiving and mentalizing emotions (Swart, Kortekaas, & Aleman, 2009).

A handful of studies have examined emotion regulation strategies associated with alexithymia. The results from these studies suggest that alexithymia is also associated with less healthy emotion regulation strategies. For example, Swart et al. (2009) reported that alexithymic individuals used more suppressive than reappraisal emotion regulation strategies. Suppressive strategies may be favoured over appraisal because of the impairments in the cognitive processing of emotion, alexithymics' may lack the ability to cognitive reappraise their emotions.

Current debate surrounds whether alexithymia is a state or trait phenomenon. Alexithymia is considered to be a stable personality trait that predisposes individuals into developing psychiatric and medical illness (Sifneos, 1973; Taylor at al., 1997). However, in 1977 it was suggested that alexithymia may also represent a state phenomenon arising from psychological distress (Freyberger, 1977). Freyberger (1977) termed this secondary

alexithymia. The argument for alexithymia being a state phenomenon arising from negative affect is based on evidence that alexithymia positively correlates with anxiety, depression, somatization and negative affect (Bagby, Taylor, & Ryan, 1986; Deary, Scott, & Wilson, 1997; Hendryx, Haviland, & Shaw, 1991; Honkalampi, Hintikka, Tankanen, Lehtonen, & Vinamäki, 2000; Taylor et al., 1997). However, other research has demonstrated that alexithymia is a distinct trait separate from depression (Parker, Bagby, & Taylor, 1991), somatization (Bach, Bach, & de Zwaan, 1996) and negative affect (Taylor et al., 1997).

For example Salminen et al. (1994) followed 54 psychiatric outpatients diagnosed primarily with anxiety and mood disorders for 1-year. In this study, 65% of the patients received psychiatric treatment, mainly psychotherapy and pharmacotherapy; the remaining 35% received no treatment. At the end of the one year period an abbreviated version of The Brief Symptom Inventory indicated a significant decrease in psychological distress whereas alexithymia measured by the TAS did not significantly change. Saarijärvi, Salminen, and Toikka (2001) also reported that TAS-20 alexithymia scores did not change significantly at 1-year follow-up in 149 psychiatric outpatients diagnosed with major depression; although depression and psychological distress scores had decreased significantly.

An Italian study investigating alexithymia in patients with inflammatory bowel disease (IBD) reported the rate of alexithymia in the IBD patients was 35.7% compared to 4.5% in a control group of healthy adults matched for sex, age and education (Porcelli, Zaka, Leoci, Centonze, & Taylor, 1995). Alexithymia was not related to the duration of illness or the level of disease activity, suggesting that alexithymia was not a reaction to illness chronicity or severity. At six months follow up there was no significant change in mean alexithymia scores as measured by the TAS-20 (Porcelli, Leoci, Guerra, Taylor, & Bagby, 1996). However, depression and anxiety scores were influenced by changes in symptom activity. This suggests that alexithymia is a stable trait in IBD patients whereas depression

and anxiety are state phenomenon influenced by disease activity. The results of this study support the notion that alexithymia is not simply a consequence of psychological distress, although it is still uncertain whether alexithymia is an antecedent or a reaction to developing a chronic illness. Prospective research should be conducted in a large, at risk population before the onset of disease to better understand how alexithymia is related to chronic and psychiatric illness.

Most longitudinal studies assessing the stability of alexithymia have short follow-up periods, usually a few weeks to a year (Luminet, Bagby, & Taylor, 2001). The longest follow-up period is from a study by Tolmunen et al. (2011). These researchers investigated alexithymia in 755 middle aged Finnish men. At the 11-year follow-up alexithymia scores showed stability while controlling for depressive symptoms, a history of mental illnesses and cancer or cardiovascular disease at baseline and at the 4th and 11th year follow-ups. This study had a general population sample whereas previous research has mainly been conducted in clinical populations of psychiatric and somatic patients. This strengthens their results as psychiatric and somatic morbidity may confound findings of alexithymia (Tolmunen et al., 2011).

A study conducted by Honkalampi, Hintikka, Saarinen, Lehtonen, and Viinamäki (2000) reported contrasting findings. Honkalampi, Hintikka, Saarinen et al. (2000) followed 169 outpatients with a DSM-III-R diagnosis of depression, for 6-months. The patients received psychotherapy and/or pharmacotherapy. Patients were categorised as either alexithymic or non-alexithymic based on the empirical cut-off score on the TAS-20 of 61 or greater, in contrast to the majority of studies that have measured alexithymia as a continuous variable. At baseline 39% of the patients were classified as alexithymic, at the 6-month follow-up only 23% were still alexithymic. A regression analysis was conducted on the entire sample where it was reported that 20% of the variation in TAS-20 was explained by Beck

Depression Inventory scores at baseline and 42% at follow-up. From these results Honkalampi, Hintikka, Saarinen et al. (2000) concluded that alexithymia is not a stable personality trait, but rather a secondary state phenomenon to depression.

These studies have assessed the "absolute stability" of alexithymia, the "relative stability" of alexithymia was not considered. Absolute stability refers to the change in an individual's personality score over time. Relative stability refers to the association of the follow-up score relative to the baseline score. Luminet, Rokbani, Ogez, & Jadoulle (2007) investigated the absolute and relative stability of alexithymia in 122 women with a first instance of breast cancer. The women completed the TAS-20 and the Hospital Anxiety and Depression Scale the day before surgery and 6-months later. Alexithymia scores significantly changed from baseline to follow-up indicating a lack of absolute stability, although the effect size was small. However, there was evidence of relative stability with alexithymia scores at follow-up correlating significantly with baseline alexithymia scores. Furthermore, a substantial and significant amount of the variance in follow-up alexithymia was explained by baseline alexithymia even when the effects of depression and anxiety were controlled for.

One study attempted to assess the stability of alexithymia prospectively; most studies have investigated the stability of alexithymia after a reduction in distress. Mikolajczak and Luminet (2006) aimed to investigate the stability of alexithymia after an increase in acute psychological distress in a sample of undergraduate psychology students. Baseline alexithymia and psychological distress scores were collected at the beginning of the academic year using the Brief Symptom Inventory as the measure of psychological distress and the TAS-20. Follow-up alexithymia and psychological distress scores were collected 12-weeks later, during the exam period. There was a significant increase in psychological distress from baseline to follow-up, with significant increases in mean scores of the Brief Symptom Inventory. Alexithymia was associated with psychological distress at baseline and at follow-

up. Relative and absolute stability were analysed using Pearson correlation coefficients. A correlation of 1 would indicate absolute stability as this would show scores did not change over time. A large significant positive correlation was found between baseline and follow-up alexithymia scores, $p = .74$; indicating relative stability, but not absolute stability. Further indicating relative stability regression analysis of follow-up alexithymia showed that although a significant amount of the variance could be explained by psychological distress, the greatest amount of variance was explained by baseline alexithymia scores. Although psychological distress increased from baseline the levels were still well below levels for a clinical population, therefore the results cannot be generalised to more severe types of psychological distress such as major depression.

All of the studies reviewed in this section reported significant associations between alexithymia and negative affect. Therefore, it appears that alexithymia and negative affect are closely related. Although it appears that alexithymia is a distinct construct from depression and anxiety since negative affect does not explain all the variance in alexithymia scores. Nevertheless given the high association between alexithymia and negative affect, negative affect should be considered a confounding variable when researching alexithymia and thus should be controlled for.

Alexithymia and Eating Behaviour

Many theories of eating exist. Recently research has provided consistent evidence in support of theories that favour an emotion regulation model of eating behaviours (Anestis, Smith, Fink, & Joiner, 2009). These theories speculate that individuals engage in dysregulated eating behaviours in an attempt to alleviate negative affect. Some individuals may eat as an emotion regulation strategy developing problematic eating behaviours. Therefore, problems with emotion regulation may contribute to the development and maintenance of problematic eating behaviour.

Psychological and biological mechanisms have been proposed to explain why alexithymia may play an important part in eating (Bruch, 1973). Where decreased eating is seen as the natural biological response to distress (Schachter et al., 1968); increased eating may occur in people who as a result of learning experiences early in life, develop a lack of interoceptive awareness and confuse emotional distress with hunger, thus leading to emotional eating (Bruch, 1973). The contribution of alexithymia in emotional eating has received very little study. This is surprising considering the central feature of psychosomatic theory is poor interoceptive awareness (Bruch, 1973) which shares some similarity to alexithymia, particularly the aspect of "difficulty identifying feelings", and with both concepts placing emphasis on the confusion of internal states.

Alexithymia and eating behaviour has mainly been studied in eating disordered populations beginning with Bruch. Bruch's observations of patients with eating disorders having difficulty recognising and describing emotions predated the formulation of the alexithymia construct (Bruch, 1962; Bruch, 1973). Empirical studies have confirmed these clinical observations with high rates of alexithymia found in eating disorder patients. Rates of alexithymia range from 48% - 77% for patients with anorexia nervosa (AN) and 40% - 61% for patients with bulimia nervosa (BN) (Bourke, Taylor, Parker, & Bagby, 1992; Cochrane, Brewerton, Wilson, & Hodges, 1993; deGroot, Rodin, & Olmstead, 1995; Jimerson, Wolfe, Franko, Covino, & Sifneos, 1994; Schmidt, Jiwany, & Treasure, 1993). Alexithymia has been less studied in BED although it appears that high alexithymia scores are associated with BED (Carano, et al., 2006; Pinaquy et al., 2003).

Little is known about the relation between alexithymia and eating behaviour in non-clinical samples. Further research is needed in non-clinical populations to understand the contribution of alexithymia in general eating behaviour. Therefore the association between eating behaviour and alexithymia needs to be inferred from studies utilising clinical samples.

Pinaquy et al. (2003) investigated the relationship between alexithymia and emotional eating in 169 obese women with and without BED. The presence of BED was assessed using the Questionnaire for Eating and Weight Patterns Revised and a confirmatory clinical interview. Participants completed the Beck Depression Inventory, the State Trait Anxiety Inventory, the Stress Perceived Scale, the DEBQ and the TAS-20. Of the 169 women, 40 were identified as having BED. BED and non-BED subjects were compared on social demographics and were found to be comparable in age, BMI, education level and socio-economic status. BED participants scored significantly higher than non-BED participants on trait anxiety, perceived stress and depression and reported emotional and external eating was significantly higher in BED participants; there was no difference in restrained eating. The non-BED and BED women also differed on total alexithymia and two of the three alexithymia subscales; BED women scored higher on the difficulty identifying feelings subscale and the difficulty describing feelings subscale; the women did not differ on the externally orientated thinking subscale. Separate regression analyses were conducted to establish the relationship between alexithymia and emotional eating. The regression analysis included TAS-20 total score, perceived stress, depression score, state anxiety and trait anxiety. Separate regression analyses were conducted for BED and non-BED groups, the overall association between alexithymia and emotional eating was not reported. The results showed that the predictors of emotional eating differed between the BED and non-BED groups. Alexithymia was revealed to be a significant predictor of emotional eating only for the BED group, where alexithymia predicted emotional eating over and above stress, depression and anxiety. Only perceived stress and depression were significant predictors of emotional eating in the non-BED participants.

Further analysis was conducted replacing the TAS-20 score for each of the TAS subscales. None of the separate alexithymia subscales were associated with emotional eating

for the non-BED group. For the BED women only the difficulty identifying feelings subscale was a predictor of emotional eating. The results of this study support Bruch's idea of difficulty identify feelings being central to emotional eating (Bruch, 1973). However, alexithymia was only related to emotional eating in the women with BED, when anxiety, depression and stress were controlled for. This study may suggest that alexithymia is related to problematic eating behaviours in eating disordered individuals however further research is needed to investigate this. In this study emotional eating was not studied per se but the focus was on the differences between obese individuals with and without BED.

Larsen, van Strien, Eisinga, and Engels (2006) investigated the relationship between alexithymia and emotional eating in a sample of 413 obese men and women. Participants completed self-report questionnaires, the Symptom Checklist-90 using the depression subscale to measure depression, the DEBQ to assess emotional eating and the TAS-20 to assess alexithymia. Gender differences were found for depression and emotional eating, with women reporting more depression and emotional eating. Males and females showed no difference in the TAS-20 total score, the difficulty identifying feelings subscale or the difficulty describing feelings subscale however, men scored higher on the externally orientated thinking subscale than women. Alexithymia was associated with more emotional eating with only the subscales difficulty identifying feelings and difficulty describing feelings being significant. Gender effects were examined and the correlations between alexithymia and emotional eating were stronger for men than women. Separate hierarchical regression analyses were performed for men and women using the separate subscales of the TAS-20, predicting emotional eating. In men the difficulty identifying feelings subscale was a significant predictor of emotional eating over and above age and depression explaining 27% of the variance; for women age, depression and difficulty identifying feelings were significant predictors and explained but only 12% of the variance. The difficulty describing

feelings subscale and depression were a significant predictor of emotional eating in men explaining 25% of the variance; for women difficulty describing feelings was not a significant predictor of emotional eating with age and depression being significant predictors. Both Larsen, van Strien et al.'s (2006) and Pinaquy et al.'s (2003) results suggest that alexithymia is associated with emotional eating, especially the difficulty identifying dimension of alexithymia.

Contrasting findings have been reported by Noli et al. (2010). These authors studied 150 obese individuals undergoing bariatric surgery and 132 individuals at least 1-year after biliopancreatic diversion (BPD). Emotional eating was assessed by structured interview and alexithymia with the TAS-20. High rates of alexithymia were found in those obese patients undergoing bariatric surgery and in the BPD patients. This finding confirms other findings of high prevalence rates of alexithymia in obese populations (Adami, Campostano, Ravera, Leggieri, & Scopinaro, 2001; Clerici, Albonetti, Papa, Penati, & Invernizzi, 1992; Elfhag & Lundh, 2007; Legorreta, Bull, & Kiely, 1988) and suggests that alexithymia is not secondary to having a chronic condition as in the BPD group body weight had normalised; although the mean BMI of 34.4 for this group is still considered overweight. However, contrary to previous research (Larsen, van Strien et al., 2006; Pinaquy et al., 2003) comparison between alexithymics and non-alexithymics revealed no difference in reported emotional eating.

The research from clinical samples suggests that alexithymia may be associated with emotional eating. Especially the difficulty identifying feelings subscale of the TAS-20; results for the difficulty describing feelings subscale have been mixed; externally orientated thinking does not appear to be related to emotional eating.

A limitation of these studies is that the samples examined were obese and were motivated to lose weight, having been recruited in obesity clinics (Larsen, van Strien et al., 2006; Pinaquy et al., 2003), with a few recruited from advertisements and were offered a

personal eating diagnosis for their participation suggesting possible motivation to lose weight (Larsen, van Strien et al., 2006). Therefore, these results may not generalize to the general obese population. Furthermore, by only including obese individuals the results cannot be generalised to all individuals who report emotional eating; emotional eating is often found in normal weight individuals (van Strien et al., 1986). Therefore, these studies are limited in generalising the link between alexithymia and emotional eating. To truly examine whether alexithymia is associated with emotional eating as implied by psychosomatic theory, research should be conducted in non-clinical normal weight samples.

Alexithymia and Impulsivity

Sifneos stated that alexithymia patients demonstrated tendencies to act rather than talk about feelings (Sifneos, 1996). Alexithymia has been associated with many behaviours and disorders that are associated with impulsivity e.g. alcohol abuse (Shishido, Gaher & Simons, 2013; Thorberg et al., 2009), self-injury (Zlotnick et al., 1996) pathological gambling (Lumley & Roby, 1995; Parker, Wood, Bond, & Shaughnessy, 2005), BED and binge eating (Carano et al., 2006; Wheeler, Greiner, & Boulton, 2005).

The deficits in the cognitive processing of emotion that are characteristic of alexithymia, may explain why alexithymia is associated with impulsive behaviours. Dual process models of impulsivity assert that impulsive individuals tend to rely on reflexive affective processes, rather than on reflective cognitive processes (Metcalfe & Mischel, 1999). Metcalfe and Mischel's (1999) hot/cold system provides a possible framework for understanding the role of impulsivity in alexithymia.

The cool system is the thinking system; it is emotionally neutral, thoughtful and introspective. The cool system integrates knowledge about feelings, sensations and goals. In contrast the hot system is the "go" system; it is impulsive and emotional. Deficits in the cognitive processing of emotion as seen in alexithymia may mean that the cool system may

fail these individuals because they are unable to cognitively reappraise their emotions and integrate their thoughts, feelings and sensations. Cognitive reappraisal is considered a cooling strategy because it can provide distance from a negative situation and is considered a healthy emotion regulation strategy. Alexithymics have been shown to use less reappraisal strategies (Swart et al., 2009). Furthermore, the balance of the cool-and-hot systems is determined by stress and psychological distress (Metcalfe & Mischel, 1999). Alexithymia and psychological distress are highly associated thus the hot system may be more active in alexithymics than the cool system.

Few studies have investigated the association between alexithymia and impulsivity. Fink, Anestis, Selby, and Joiner (2010) investigated the role of alexithymia and impulsivity in dysregulated behaviours, using the UPPS impulsivity framework set out by Whiteside and Lynam (2001). It was hypothesised that only the urgency dimension would be positively related to alexithymia and dysregulated behaviours, because dysregulated behaviours tend to happen when emotional. Consistent with predictions alexithymia was associated with urgency and dysregulated behaviours. Contrary to predictions alexithymia was also positively correlated with lack of perseverance and lack of premeditation. The results of a mediation analysis suggested that urgency fully mediated the pathway between alexithymia and dysregulated behaviours. The other impulsivity dimensions were explored as possible mediators. Sensation seeking and lack of perseverance did not appear to be mediators; although, lack of premeditation partially mediated the pathway between alexithymia and dysregulated behaviours. Shishido et al (2013) reported similar findings in their study of alexithymia, impulsivity and alcohol use and related problems in 429 undergraduate students. Urgency was found to mediate the relationship between alexithymia and alcohol related problems.

Zimmermann, Rossier, Meyer, de Stadelhofen, and Gaillad (2005) set out to investigate the relationship between alexithymia, impulsiveness, locus of control, irrational beliefs and both the domain and facet levels of FFM of personality in undergraduate students. Impulsivity was assessed using the I_7 Impulsiveness Questionnaire which comprises three subscales, Impulsiveness (people who act on the spur of the moment without being aware of the risks), Venturesomeness (people who are aware of the risks but take part in the behaviour anyway) and Empathy (a control dimension that is unrelated to the other two subscales). Only the impulsiveness subscale of the I_7 Impulsiveness Questionnaire was associated with alexithymia, and only the subscale difficulty identifying feelings. The domain neuroticism from the FFM was positively associated with total alexithymia and the difficulty identifying feelings and difficulty describing feelings subscales. The difficulty identifying feelings subscale showed the greatest association. Total alexithymia and difficulty identifying feelings were associated with the facet impulsiveness from the FFM.

Alexithymia, Impulsivity and Emotional Eating

Two studies have investigated the relationships between alexithymia, impulsivity and emotional eating. Van Strien and Ouwens (2007) randomly assigned female participants to either an experimental condition or a control condition which included a taste test and either a distress manipulation task or control task. In the experimental condition participants were told that their taste perception would be compared to their speech fluency and they were to give a five minute speech on a topic that would be revealed after the taste test in front of three observers. Participants in the control condition were told that their taste perception would be compared to their sense of touch and were told that they would touch a variety of fabrics after the taste test. Participants were given three bowls of crackers and told to rate the flavours and they could eat as much as they wanted. The TAS-20 subscales difficulty identifying feelings and difficulty describing feelings subscales correlated highly (r = .70) so were combined into

one variable. The combined alexithymia feelings subscales showed a large correlation with impulsivity, measured with the Eating Disorder Inventory-II (EDI-II) impulse regulation subscale. Alexithymia moderated the relationship between food intake and distress, in that higher levels of alexithymia were related to higher levels of food intake in the distress condition. Although impulsivity was strongly correlated with alexithymia, impulsivity was not associated with emotional eating. A limitation of this study is that impulsivity was measured as a unidimensional construct. Previous research has shown that different aspects of impulsivity are associated with eating behaviour; therefore multidimensional assessment of impulsivity should be done to examine the relation between emotional eating and impulsivity.

Ouwens et al. (2009) conducted a study on 549 females recruited through local newspaper advertisements, an obesity journal and at an intake screening at an obesity clinic. Mean BMI was in the overweight range, 33.5. Emotional eating, difficulty identifying feelings, depression and impulsivity were assessed and entered into a structural equation model. Emotional eating, impulsivity and depression were positively related to the alexithymia dimension difficulty identifying feelings. Depression was directly associated to emotional eating. Depression was also indirectly associated with emotional eating through difficulty identifying feelings and impulsivity. This suggests that the pathway between negative affect and emotional eating may be mediated through impulsivity. These two studies show that impulsivity is associated with difficulty identifying feelings and difficulty describing feelings; however it is unclear if impulsivity is associated with the relationship between alexithymia and emotional eating since both studies reported contrasting findings.

Negative Affect

Negative affect is central to many theories of overeating (e.g. escape theory, masking theory). According to the affect regulation model people binge eat in an effort to provide comfort and distraction from negative emotions (Stice, 2002). Experimental research utilising

negative versus neutral mood induction has found increased caloric intake in non-eating disordered individuals (Cools & McNally, 1990; Cools, Schotte, & McNally, 1992). In a series of three experiments using female undergraduate students, Heatherton, Striepe, and Wittenberg (1998) experimentally manipulated participant's mood and their subsequent food intake was recorded. Across the three studies, Heatherton et al. (1998) found that negative mood resulted in overeating in the participants that were restrained eaters.

Depression may be related to external eating based on escape theory. According to escape theory of Heatherton and Baumeister (1991) some individuals may narrow their level of attention to the current and immediate stimulus environment, for example, accessible food cues such as snacks in order to shift attention away from an ego threatening stimulus or negative affect like stress or depression.

Newman et al. (2008) using the Stroop Test investigated attentional bias in external eaters under stress. In the Stroop Test there were three main categories of words; neutral, ego threatening and food. Food words were subcategorised into either snack or meal works by independent raters. Each food category contained healthy and unhealthy foods. Participants were either in the control condition in which they were asked to circle every t in a short piece of text for 10 minutes. Participants in the experimental condition were told that they were going to be given 10 minutes to prepare a 4 minute presentation on their opinion on a controversial topic, which would be watched by a group of psychologists and videotaped. Participants then completed the Stroop Test. The results showed that external eaters had a higher bias for snack food words when under stress. This finding is consistent with previous research which showed that high external eaters increase snack food intake when stressed (Conner et al., 1999). There was a decreased interest in meal words in the stress condition suggesting that under stress snack foods may be more appealing because they are easier to digest in an aroused physiological state (Newman et al., 2008).

Some researchers have focused on negative affect in emotional eaters (Lindeman & Stark, 2001). Lindeman and Stark's (2001) study used female university students who were all within normal weight ranges. Lindeman and Stark (2001) found that emotional eaters self-reported higher depression and more signs of eating disorder pathology including lower self-esteem and higher perfectionism levels than did normal dieters and non-dieters. This study links several of the concepts of Escape Theory with overeating, including eating in response to negative emotions, depression and perfectionism. Lindeman & Stark (2001) argue that for emotional eaters, a normal response to negative affect may be to overeat, whereas non-dieters may be more likely to lose their appetite. A meta-analysis of risk and maintenance factors of eating pathology concluded that negative affect is a risk factor for eating pathology and is a causal mechanism in overeating (Stice, 2002).

Research has shown that emotional and external eating tends to co-occur. Some doubt that the two eating styles are separate. Ouwens et al. (2009) demonstrated through structural equation modelling that different pathways exist between negative affect and emotional and external eating. Depression and the alexithymia factor difficulty identifying feelings were directly related to emotional eating. Depression was indirectly associated with external eating through the mediating variable impulse regulation. Difficulty identifying feelings was not associated with external eating. As previously discussed central to emotional eating theory is lack of interoceptive awareness whereas external eaters are drawn to the food stimuli. Therefore, emotional eating may be characterised more by emotion regulation whereas in external eating negative affect may be related because it increases attention to food cues making the external eater less able to control their impulses. Consequently there may be different pathways between negative affect and emotional and external eating.

The Current Study

Research suggests that impulsivity may be related to both emotional and external eating. Evidence from clinical populations and psychosomatic theory suggests that alexithymia could be a factor contributing to emotional eating. Negative affect is central to many theories of eating behaviour and there are possibly different pathways from negative affect to different types of eating behaviour.

Emotionality factors may be related to these eating styles through the intervening construct impulsivity. Impulsive behaviours such as intake of alcohol and drugs have been theoretically proposed to escape negative affect. Therefore, poor impulse regulation may explain the relationship between negative affect, impulsivity and external eating theoretically fitting with escape theory. It is proposed that for emotional eating impulsivity will be an intervening construct between alexithymia and emotional eating according to Mischel's hot/cold framework. It is proposed that alexithymia is the key variable in emotional eating and that the inability to cognitively process emotions which is characteristic of alexithymic individuals leads to impulsive behaviour.

Given the limited knowledge of the underlying constructs of emotional and external eating one of the aims of the current study was to investigate alexithymia and impulsivity as possible underlying constructs of emotional and external eating in a non-clinical sample. A non-clinical sample was chosen because there has been little research examining alexithymia and impulsivity in non-eating disordered populations. Investigating these variables in a non-clinical sample will expand the understanding of the factors that contribute to eating behaviour. The UPPS model of impulsivity proposed by Whiteside and Lynam (2001) was used since previous research has shown that impulsivity is a multidimensional construct and different impulsivity dimensions may be related to different eating behaviours. Female

participants were chosen because women report significantly more stress related eating than men (Greeno & Wing, 1994).

The second aim of this study was to determine whether different pathways exist between negative affect and emotional and external eating. Anxiety and depression (i.e. negative affect) were identified as potential confounding variables with alexithymia and were included in the research. Furthermore, negative affect was included to examine whether different patterns of association between negative affect and emotional and external eating existed. The following hypotheses were formulated for this study:

Hypothesis 1: Urgency and lack of perseverance dimensions of impulsivity will be positively related to alexithymia; in particular the difficulty describing and identifying feeling components.

Hypothesis 2: Emotional and external eating will be positively related to BMI.

Hypothesis 3: Those high in emotional eating will show elevated alexithymia scores; in particular the difficulty describing feelings and identifying feelings subscales of the TAS-20. It is expected that higher levels of self-reported depression and anxiety in those with high emotional eating scores will account for some of the elevation in alexithymia scores. However, there are conflicting research findings as to whether depression and/or anxiety can entirely account for elevated alexithymia. This will be investigated by controlling for depression and anxiety in statistical analyses.

Hypothesis 4: Emotional eating will be positively related to the urgency and lack of perseverance.

Hypothesis 5: External eating will show a positive association to depression.

Hypothesis 6: External eating will be positively related to the impulsivity dimension urgency and lack of perseverance.

Hypothesis 7: Lack of perseverance will be related to emotional and external eating as an artefact of depression and anxiety. That is, once depression and anxiety are included in the model, lack of perseverance will no longer be significant.

Hypothesis 8: Alexithymia and urgency will interact in predicting emotional eating with urgency acting as a moderator of the relationship between alexithymia and emotional eating. The confounding effect of anxiety and depression will be statistically controlled for.

Hypothesis 9: Urgency will mediate the relationship between depression and external eating.

Method

Participants

Participants were 226 female students from the University of Canterbury. Participants were recruited either via email or from the first year psychology participant pool. This study was approved by the University of Canterbury Human Ethics Committee (HEC 2012/75) see appendix A for documentation. Participants recruited via email were invited to enter a prize draw to win one of three $50 vouchers. Participant pool participants received course credit for their participation in the study.

Measures

Copies of the questionnaires used in this study can be found in appendices C – G.

Demographics questionnaire. The demographics questionnaire asked participants their age, ethnicity, years of completed tertiary study, weight, height and diagnoses/treatment of eating disorders and psychiatric illnesses.

Body Mass Index (BMI). BMI was calculated from self-reported weight and height (BMI = weight in kilograms/(height in meters)^2).

Dutch Eating Behavior Questionnaire (DEBQ; van Strien, Frijters, Bergers, & Defares, 1986). The DEBQ is a widely used 33-item self-report questionnaire designed to assess three types of eating behaviour; Emotional Eating (13 items), eating in response to emotional states; External Eating (10 items), eating in response to external food cues; Restrained Eating (10 items), the extent to which the individual restrains their food intake. Responses are made on a 5-point scale, ranging from 1 (seldom) to 5 (very often). The DEBQ's authors have reported acceptable Cronbach's α ranging from .80 to .95 (van Strien et al., 1986). The restrained eating subscale was not utilised in this study.

UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001). The UPPS is a 45-item multidimensional measure of impulsivity that assesses four distinct dimensions of

impulsivity; urgency, lack of premeditation, lack of perseverance, and sensation seeking; based on the personality factors of the FFM (McCrae & Costa, 1992). The subscale urgency refers to a tendency to give into impulses when experiencing negative affect, based on the FFM factor neuroticism. Lack of premeditation refers to a tendency to act without thinking, based on the factor conscientiousness. Lack of perseverance refers to a tendency to give up and not persist in tasks, also based on the conscientiousness factor. Finally, sensation seeking refers to a tendency to engage in certain behaviour for a thrill, aligned with the extraversion factor. Items are rated on a 4-point scale ranging from 1 (strongly disagree) to 4 (strongly agree) with higher scores reflecting greater impulsivity.

Toronto Alexithymia Scale-20 (TAS-20; Bagby, Parker et al., 1994). The TAS-20 is a well validated 20-item self-report questionnaire used to assess alexithymia. It is the most widely used measure of alexithymia. The TAS-20 demonstrates good internal consistency and test-retest reliability (Bagby, Parker et al., 1994). The TAS-20 includes three subscales. The first subscale, difficulty identifying feelings, assesses the ability to identify feelings and to distinguish between feelings and bodily sensations. The second subscale, difficulty describing feelings, assesses ability to describe or communicate feelings to other people. Lastly the third subscale, externally orientated thinking, assesses the degree of external cognitive orientation and also captures a lack of fantasy life. Items are rated on a 5-point scale of 1 (strongly disagree) to 5 (strongly agree).Confirmatory factor analysis has demonstrated the stability and replicability of the measure's three factor structure in both clinical and non-clinical populations (Bagby, Parker et al., 1994).

Depression, Anxiety, and Stress Scale -21 (DASS-21; Lovibond & Lovibond, 1995). The DASS-21 is a 21-item self-report questionnaire designed to measure the severity and range of symptoms common to depression, anxiety and stress. The DASS-21 comprises three subscales each with 7 items; depression, anxiety and stress. The Depression subscale

assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, and anhedonia. The Anxiety subscale assesses autonomic arousal, muscle tension, situational anxiety, and the experience of anxious affect. The Stress scale is sensitive to levels of chronic non-specific arousal. Responses are made on a 4-point scale from 0 (did not apply to me at all over the last week) to 3 (applied very much or most of the time over the past week). Excellent Cronbach α's in healthy control samples have been reported; .91 for depression, .84 for anxiety, and .90 for stress (Lovibond & Lovibond, 1995). Only the depression and anxiety subscales were used for this study.

Procedure

This study utilised a cross-sectional design. Participants recruited via email received an email to their university email account which contained a link to the questionnaires online; those recruited from the first year psychology participant pool were given the link to the study when they signed up to participate through the participant pool portal. Online questionnaire administration was run by Qualtrics software. Participants were informed on the first page along with the study information that by clicking "next" and preceding to the questionnaires that they were giving consent to participate in the study, and they would be unable to remove the information they had provided once the questionnaires were completed. Completion of the questionnaires took approximately 30 minutes. Copies of the information sheets can be found in appendix B.

Statistical Analyses

All variables were inspected for outliers, skew, kurtosis and normality. No problems were observed except for the DASS-21 depression and anxiety subscales and BMI. These subscales showed slight positive skew, suggesting that this sample was not particularly depressed or anxious and few individuals had BMI's in the overweight to obese categories. More lower scores on depression, anxiety and BMI would be expected in this sample as it is

not a clinical sample and therefore high levels of depression, anxiety and overweight would not be expected. Although there was slight positive skew it was still within the acceptable range not to violate normality assumptions. In preparation for the multiple regression analysis variables were inspected for homoscedasticity and linearity using a scatterplot. All variables showed a linear relationship.

Descriptive statistics were then conducted for each variable to gather information about the mean, standard deviation and range of each variable. Chronbachs alphas were calculated to assess the internal consistency of each scale. Ideally the Chronbach coefficient should be above .70.

Correlations were used to determine relationships between variables and to check for multicollinearity in preparation for the regression analyses. To control for the possible confounding of anxiety and depression when examining variables relationships with alexithymia partial correlations were calculated.

To examine if urgency and alexithymia had an interaction effect in predicting emotional eating, while controlling for anxiety and depression a moderation analysis was conducted using the steps formulated by Baron and Kenny (1986). An interaction variable was created by multiplying urgency and alexithymia and variables were mean-centred. Mean-centering has been recommended to reduce the multicollinearity between the predictor variables and the interaction term (Aiken & West, 1991; Cohen & Cohen, 2003). Secondly, a hierarchical regression analysis was conducted whereby anxiety and depression were first added to the model, urgency and alexithymia were added second and the interaction term was added third.

The mediation analysis to investigate if urgency mediated the relationship between depression and external eating was done according to Baron and Kenny's (1986) guidelines. A series of regression models were performed. The conditions of mediation are that the

independent variable must predict the mediator, the independent variable must predict the dependent variable and once the mediator is included in the model the association between the independent variable and the dependent variable must decrease. Sobels z test was conducted to examine whether the reduction in the relationship between the independent variable and the dependent variable once the mediator was added to the model was significant.

Separate hierarchical regression analyses were conducted to examine whether lack of perseverance predicted emotional or external eating over and above depression and anxiety. Lack of perseverance was added into the model at step one, at step two depression and anxiety were added.

Only participants who had data for every item of a scale were included in the analysis. Participants also had to have filled out at least the TAS-20 and the DEBQ to be included in the analysis, excluding 23 participants from analysis.

All analyses were performed using SPSS 20.0. The Sobel z test and pictorial representation of the mediation analysis were done using Medgraph 2.0 (Jose, 2003). An alpha level of <.05 was adopted for all statistical analyses.

Results

Descriptive Analyses

Characteristics of the sample. Table 2 displays the demographic characteristics for the sample. The mean age of the sample was 21.98 (SD = 5.33) with a large range of ages ranging from 17 – 51. The majority of participants identified themselves as New Zealand European. The other category mainly included Caucasian ethnicities; Australian, American and British.

Table 2

Participant Characteristics

	M or %	*SD or n*
Age	21.98	5.33
Ethnicity		
New Zealand European	80.10%	181
Maori	4.40%	10
Asian	2.20%	5
Other	13.3%	30
Years of Tertiary Study	2.12	1.76
BMI	23.67	4.15

Seventeen participants (7.5%) reported having been diagnosed or treated for an eating disorder and 58 (25.7%) participants reported having been diagnosed or treated for a mental illness

BMI for the current sample ranged from underweight to obese. According to accepted BMI categories (World Health Organisation, 2006) the mean BMI for females was within the normal range (M=23.67, SD=4.15). Most of the sample reported BMI's in the normal weight range (n=148; 66%), 16 (7%) participants were underweight, 44 (20%) were overweight and 17 (8%) participants could be categorised as obese.

Descriptive Statistics for Eating Behaviours, Impulsivity, Alexithymia and Negative Affect. See Table 3 for means, standard, deviations, ranges and Chronbach alphas for the scales used in this study. Chronbach alphas were acceptable for most of the scales,

showing Chronbach alphas greater than .70. The externally orientated thinking subscale showed poor internal consistency $\alpha = .66$.

Emotional and external eating in this sample was similar compared to scores reported in other university samples (Burton, Smit, & Lightowler, 2007; van Strien et al., 1986; Wardle, 1987).

Mean scores for each of the UPPS impulsivity dimensions except for sensation seeking were comparable to scores reported in community samples (Whiteside & Lynam, 2009; Whiteside, Lynam, Miller, & Reynolds, 2005) and a university sample (Shishido et al., 2013). This sample showed higher scores on sensation seeking than was previously reported in the community samples (32.15 in this sample vs. 26.11 Whiteside et al., 2005 and 23.89 Whiteside & Lynam, 2009).

The mean total alexithymia score of 49.69 for this sample is similar to scores reported by Mason, Tyson, Jones, and Potts, 2005. In a sample of female British university students Mason et al. (2005) reported a mean score of 49 (SD = 11.7). Using the empirically derived cut-off score of >61 (Taylor et al., 1997) the prevalence of alexithymia was 13.3% in this sample. In this sample the prevalence of alexithymia was less than the prevalence reported by Mason et al. (2005), who reported a prevalence of 20%.

The mean depression score from the DASS-21 (M = 4.73; SD = 4.54) in this sample was similar to the mean 4.27 (SD = 4.32) reported in another university sample (Norton, 2007), but was higher than the mean reported in a general population sample M = 2.83; SD = 3.87 (Henry & Crawford, 2005). Although the mean score in this sample was higher than that reported in a general population sample it was still within the normal range (Lovibond & Lovibond, 1995). Anxiety scores (M = 4.09; SD = 3.97) in this sample were higher compared to the mean score reported by Henry and Crawford (2005) M = 1.88 (SD = 2.96) but was reasonably similar to the mean reported by Norton (2007) M = 3.85 (SD = 3.79).

Overall, compared to other university and general population samples, the current sample was similar. The only variable that appeared to consistently deviate from previous samples was sensation seeking, in which the current sample appeared to be higher than previously reported.

Table 3

Means, Standard Deviations, Ranges and Chronbach Alphas for Eating Behaviour, Impulsivity, Alexithymia and Negative Affect

					Range	
	n	*M*	*SD*	*α*	Actual	Potential
Emotional Eating	224	2.66	0.79	.94	1 – 5	1 – 5
External Eating	224	3.21	0.55	.82	1.50 – 4.80	1 – 5
Impulsivity						
Urgency	216	29.43	5.18	.82	12 – 45	12 – 48
Lack of Premeditation	216	24.13	4.47	.82	14 – 38	11 – 44
Lack of Perseverance	216	21.78	3.91	.79	10 – 35	10 – 40
Sensation Seeking	216	32.15	6.82	.88	12 – 48	12 – 48
Alexithymia Total	226	49.69	10.57	.86	22 – 82	20 – 100
Difficulty Identifying Feelings	226	17.50	535	.84	7 – 33	7 – 35
Difficulty Describing Feelings	226	13.07	3.86	.76	5 – 23	5 – 25
Externally Orientated Thinking	226	19.11	4.00	.66	9 – 29	8 – 40
Depression	213	4.73	4.54	.91	0 – 18	0 – 21
Anxiety	213	4.09	3.97	.84	0 – 18	0 – 21

Note: The variation in sample size is due to the variation in the number of participants who completed each questionnaire. Sample size is for a completed questionnaire, i.e. there were no missing items. Missing data is completely at random and are not related to the value of any other variable in the data set.

Correlation Analysis

Correlations between alexithymia, impulsivity, negative affect and emotional and external eating are presented in Table 4. Consistent with previous research emotional and external eating were positively related, showing a moderate to large strength correlation.

Table 4

Pearson Correlation Coefficients between Eating Behaviour, BMI, Impulsivity, Alexithymia and Negative Affect

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Emotional Eating	-												
2. External Eating	.47***	-											
3. BMI	.23***	.06	-										
4. Alexithymia Total	.40***	.16*	.11	-									
5. Difficulty Identifying Feelings	.42***	.17*	.07	.85***	-								
6. Difficulty Describing Feelings	.33***	.16*	.04	.87***	.69***	-							
7. Externally Orientated Thinking	.19**	.06	.15*	.66***	.25***	.42***	-						
8. Urgency	.33***	.36***	.14*	.44***	.48***	.36***	.18**	-					
9. Lack of Premeditation	-.06	-.02	-.00	.05	-.00	-.06	.20**	.39***	-				
10. Lack of Perseverance	.32***	.18**	.02	.41***	.33***	.31***	.35***	.52***	.40***	-			
11. Sensation Seeking	-.14*	-.13	-.01	-.05	-.01	-.07	-.06	-.06	.24***	-.06	-		
12. Depression	.43***	.18**	.11	.53***	.57***	.46***	.20**	.40***	.06	.38***	-.02	-	
13. Anxiety	.35***	.14*	.02	.56***	.56***	.53***	.24***	.35***	-.01	.27***	-.17*	.66***	-

* $p < .05$; ** $p < .01$; *** $p < .001$ (2-tailed).

Hypothesis 1: Urgency and lack of perseverance dimensions of impulsivity will be positively related to alexithymia, in particular the difficulty describing and identifying feelings subscales. Hypothesis one was mostly supported, with urgency and lack of perseverance having moderate strength positive correlations with total alexithymia and alexithymia components, refer to Table 4. Urgency was most strongly associated with the difficulty identifying feelings dimension of alexithymia. Both difficulty with feelings components of alexithymia were more associated with urgency than externally orientated thinking as predicted. Correlations between lack of perseverance and the alexithymia components were less supportive of predictions. The largest association with lack of perseverance is externally orientated thinking; however the difference between the externally orientated thinking and difficulty describing and identifying feelings components correlations is negligible.

Hypothesis 2: Emotional and external eating will be positively related to BMI. As shown in Table 4 hypothesis two was partially supported. BMI was positively associated with emotional eating. However, external eating was not associated with BMI.

Hypothesis 3: Those high in emotional eating will show elevated alexithymia scores; in particular difficulty describing feelings and identifying feelings subscales of the TAS-20. It is expected that higher levels of self-reported depression and anxiety in those with high emotional eating scores will account for some of the elevation in alexithmia scores. The correlation between emotional eating and total alexithymia was strongly and positively related, supporting hypothesis three, see Table 4. Consistent with predictions emotional eating was most strongly correlated with the difficulty indentifying feelings and difficulty describing feelings components of alexithymia; particulary difficulty identifying feelings.

Depression and anxiety were both strongly and positively related to emotional eating. The strength of the relationsip between depression and emotional eating was slightly stronger than the relationship between emotional eating and total alexithymia and difficulty identifying feelings although the differences were negligible suggesting both may play a part in emotional eating. Anxiety was shown to be somewhat less strongly related to emotional eating than depression, total alexithymia and difficulty identifying feelings.

Partial correlation was used to explore the relationship between emotional eating and alexithymia while controlling for depression and anxiety and are displayed in Table 5. As expected depression and anxiety accounted for some of the evelation in alexithymia scores in emotional eating. When the partial correlations are compared to the zero-order correlations the strength of the relationships is reduced by almost half. The relationship between alexithymia and emotional eating is still significant even once depression and anxiety are controlled for, with diffificulty identifying feelings still showing the strongest relationship.

Table 5

Partial Correlations between Emotional Eating, Urgency and Alexithymia Controlling for Depression and Anxiety

	1	2	3	4	5	6
1. Emotional Eating	-					
2. Urgency	.18**	-				
3. Alexithymia Total	.23***	.28***	-			
4. Difficulty Identifying Feelings	.23***	.33***	.78***	-		
5. Difficulty Describing Feelings	.15*	.19**	.82***	.56***	-	
6. Externally Orientated Thinking	.14*	.10	.67***	.16**	.36***	-

* $p < .05$; ** $p < .01$; *** $p < .001$

Hypothesis 4: Emotional eating will be positively related to the urgency and lack of perseverance. Hypothesis four was supported; emotional eating was positively correlated with urgency and lack of perseverance, refer to Table 4. From the previous research it was predicted that the other two dimensions of the UPPS model of impulsivity would not be related to eating behaviour. Contrary to this expectation sensation seeking was negatively

correlated with emotional eating; lack of premeditation was not related to emotional eating as predicted. Although sensation seeking was significantly related to emotional eating, the magnitude of the association was much smaller than that of urgency and lack of perseverance.

Hypothesis 5: External eating will show a positive association with depression. As shown in Table 4 external eating was positively correlated with depression, supporting hypothesis five.

Hypothesis 6: External eating will be positively related to the impulsivity dimensions urgency and lack of perseverance. As predicted external eating was positively associated with urgency and of moderate magnitude, see Table 4. External eating was also significantly associated with lack of perseverance. Sensation seeking and lack of premeditation were not associated with external eating. Urgency was the impulsivity dimension most associated with external eating.

Regression Analysis

Hypothesis 7: Lack of perseverance will be related to emotional and external eating as an artefact of depression and anxiety. That is, once depression and anxiety are included in the model lack of perseverance will no longer be significant. Table 6 reports the results from the hierarchical regression for emotional eating and Table 7 reports the results for external eating. Lack of perseverance was added to the model in step one with depression and anxiety added in step two. Lack of perseverance was a significant predictor of emotional eating and contrary to the hypothesis continued to be a significant predictor once depression and anxiety were added to the model; suggesting that lack of perseverance is not accounted for by depression and anxiety in emotional eating. Lack of perseverance was a significant predictor of external eating in step one of the model, however once depression and anxiety were included in the model lack of perseverance ceased to be a significant predictor

of external eating. This suggests that a lack of perseverance in external eating may be accounted for by depression and anxiety.

Table 6

Hierarchical Multiple Regression Examining Lack of Perseverance Predicting Emotional Eating

	B	*SE*	β	*t*	*R*	R^2	ΔR^2	*F* (df)
Step 1					.32	.10		24.20*** (1, 212)
Lack of Perseverance	.06	.01	.32	4.92***				
Step 2					.47	.22	.12	19.75*** (3, 212)
Depression	.05	.02	.29	3.40***				
Anxiety	.02	.02	.11	1.37				
Lack of Perseverance	.04	.01	.18	2.77***				

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 7

Hierarchical Multiple Regression Examining Lack of Perseverance Predicting External Eating

	B	*SE*	β	*t*	*R*	R^2	ΔR^2	*F* (df)
Step 1					.18	.03		6.83** (1, 212)
Lack of Perseverance	.02	.01	.18	2.61**				
Step 2					.22	.05	.02	3.50* (3, 212)
Depression	.01	.01	.12	1.25				
Anxiety	.00	.01	.03	0.33				
Lack of Perseverance	.02	.01	.13	1.71				

* $p < .05$; ** $p < .01$; *** $p < .001$

Moderation Analysis

Hypothesis 8: Alexithymia and urgency will interact in predicting emotional eating with urgency acting as a moderator of the relationship between alexithymia and emotional eating. The confounding effect of anxiety and depression will be statistically controlled for. Hierarchical regression analyses were performed to test for main effects of alexithymia and urgency on emotional eating and to see if urgency moderated the relationship

between alexithymia and emotional eating. The summary of the hierarchical regression analysis is displayed in Table 8. In step one only depression predicted emotional eating, with anxiety not being statistically significant. Step two of the regression analysis shows that depression and alexithymia all had main effects on emotional eating. Contrary to expectations urgency was not a significant predictor of emotional eating although it was approaching significance. The results do not support hypothesis eight; the interaction variable was not statistically significant suggesting that urgency does not moderate the relationship between alexithymia and emotional eating. The model explained 25% of the variance in emotional eating.

Table 8

Summary of Hierarchical Multiple Regression Examining the Interaction between Alexithymia and Urgency Predicting Emotional Eating

	B	*SE*	β	*t*	*p*	R^2	ΔR^2
Step 1						.19	
Anxiety	.11	.08	.12	1.42	.16		
Depression	.35	.08	.35	4.27	.00		
Step 2						.25	.06***
Anxiety	.01	.08	.02	0.18	.86		
Depression	.25	.08	.25	3.01	.00		
Urgency	.12	.07	.12	1.73	.07		
Alexithymia	.21	.07	.23	2.87	.01		
Step 3						.25	.00
Anxiety	.00	.08	.00	0.02	.98		
Depression	.24	.08	.24	2.86	.01		
Urgency	.14	.07	.13	1.86	.06		
Alexithymia	.21	.07	.22	2.84	.01		
Alexithymia*Urgency	.04	.05	.05	0.77	.44		

* $p < .05$; ** $p < .01$; *** $p < .001$

Mediation Analysis

Hypothesis 8: Urgency will mediate the relationship between depression and external eating. Using Baron and Kenny's (1986) procedure for estimating mediation effects a series of regression analyses were performed. From Table 9 it can be seen that the conditions of mediation were met; depression was a significant predictor of external eating

and of urgency and urgency was a significant predictor of external eating; furthermore once the mediator (urgency) was included in the regression equation the effect of depression was reduced. A Sobel test was conducted to test if the reduction once the mediator was included was significant $z = 3.42$, $p < .001$. This significant result suggests that urgency mediates the relationship between depression and external eating, as the standardized regression coefficient between depression and external eating decreases substantially when urgency is taken into account. Furthermore, the results indicate that urgency fully mediates the relationship between depression and external eating as the standardized regression coefficient between depression and external eating is no longer statistically significant when the effects of urgency are taken into account, as shown in Figure 1.

Table 9

Summary of Multiple Regression Analysis Examining the Mediational Effect of Urgency in the Relationship between Depression and External Eating

	B	*SE*	β	*t*	*R*	R^2	*F* (df)
Regression Equation 1							
Depression predicting Urgency	.46	.07	.40	6.36***	.40	.16	40.40*** (1, 212)
Regression Equation 2							
Depression predicting External Eating	.02	.01	.18	2.72**	.18	.03	7.38** (1, 212)
Regression Equation 3							
Depression and Urgency predicting External Eating					.36	.13	15.53*** (2, 212)
Depression	.01	.01	.05	0.70			
Urgency	.04	.01	.34	4.79***			

* $p < .05$; ** $p < .01$; *** $p < .001$

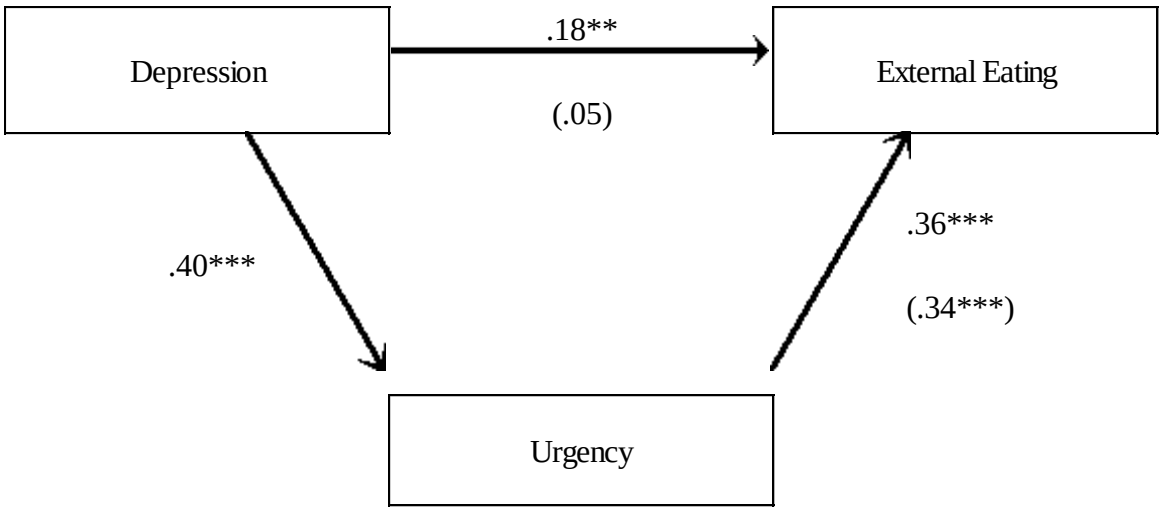

Figure 1. Mediation Model: Standardized regression coefficients for the relationship between depression and external eating as mediated by urgency. The standardized regression coefficient between depression and external eating controlling for urgency is in parentheses. ** $p < .01$; *** $p < .001$

Discussion

The aim of the current study was to examine the associations of alexithymia, impulsivity and negative affect in emotional and external eating in a normal sample and to see whether different patterns of association would emerge for emotional and external eating, to further clarify whether they are distinct constructs. In general the hypotheses of this study were supported.

Significant positive correlations were found between impulsivity and alexithymia. As predicted not all dimensions of impulsivity were related to alexithymia with only the impulsivity dimensions urgency and lack of perseverance being associated. Previous research had shown that alexithymia is related to impulsive behaviours. The finding in this study that urgency was associated with alexithymia is consistent with the results of Fink et al. (2010) and Shishido et al. (2013) that also used the UPPS impulsivity model that was employed in this study. Shishido et al. (2013) only examined urgency in relation to alexithymia whereas like the current study Fink et al. (2010) examined all dimensions. The relationship between urgency and alexithymia supports Sifneos' (1996) proposition that alexithymic individuals tend to act rather than talk. The negative experience of not being able to identify and process feelings may cause individuals to act rashly to try and alleviate internal confusion.

The finding that lack of perseverance was related to alexithymia was not found by Fink et al. (2010). Lack of perseverance may be related to alexithymia because those with high in alexithymia may not be able to persist in tasks because of an uneasiness to sit with feelings that are unable to be processed and dealt with.

This study extended the findings of Fink et al. (2010) and Shishido et al. (2013) by examining the relationship between impulsivity and the subscales of the TAS-20. It was hypothesised that impulsivity would be most strongly related to difficulty identifying feelings and difficulty describing feelings rather than externally orientated thinking. It was proposed

that an inability to process and appraise emotions that is characteristic of alexithymia may cause individuals to act rashly; because of an inability to activate the cool system, thus relying on the hot system. This was supported with urgency being most strongly related to the difficulty with feelings components of alexithymia. Lack of perseverance was positively associated with all of the alexithymia dimensions. Surprisingly lack of perseverance was most strongly associated with externally orientated thinking, although the difference in the magnitude of the correlations between lack of perseverance and externally orientated thinking and the two difficulties with feelings subscales was small.

It was predicted that BMI would be positively associated with emotional and external eating. Increased BMI was associated with emotional eating. Contrary to the hypothesis external eating was not associated with BMI. Although the second finding is not in line with the current study's hypothesis, it is consistent with previous research with previous studies reporting no association between weight status and external eating (Anschutz et al., 2009; van Strien et al., 2009; Wardle et al., 1992). The finding that increased BMI was not related to external eating suggests that responsiveness to food stimuli may be a general characteristic and not specific to overweight individuals as proposed by Schachter in the original externality theory.

Consistent with previous reports there was a positive relationship between emotional and external eating. This is in line with the proposal that emotionality and food cues can operate together to stimulate eating behaviour (Slochower, 1983). Although externality and emotionality can co-occur and interact, research into the differences between emotional and external eating has shown that emotional eating but not external eating is associated with problems in affect regulation (van Strien et al., 1995) and each eating style does not account for all the variance in the other.

Emotional Eating Findings

Research examining impulsivity and eating behaviour in normal samples has been lacking. This study found that urgency and lack of perseverance were related to emotional eating. Other studies that have examined impulsivity and eating behaviour in normal samples have also reported significant positive associations, although with the differences between impulsivity measures used, comparison is difficult.

Lyke and Spinella (2004) and Yeomans et al. (2008) examined non-planning, motor impulsivity and attentional impulsivity in the eating behaviours disinhibition, restraint and hunger. Non-planning impulsivity could be considered similar to lack of premeditation from the UPPS model used in this study, however motor and attentional impulsivity are not similar to the dimensions of impulsivity used in this study. Tentative comparisons can be done using the results of the factor analysis conducted by Whiteside and Lynam (2001) where motor impulsivity loaded on the lack of premeditation factor and attentional impulsivity loaded on the urgency factor. From previous research and the current study it appears that urgency is related to eating behaviour with Lyke and Spinella (2004) and Yeomans et al. (2008), showing attentional impulsivity is related to disinhibition and hunger and this study finding an association between emotional eating and urgency.

It was proposed that lack of perseverance may be related to depression and anxiety rather than eating behaviour, because negative affect that is often associated with problem eating behaviour may sap ones motivation to persist in tasks and previous research has shown a significant association between lack of perseverance and depression and anxiety. Contrary to predictions lack of perseverance was still a predictor of emotional eating once depression and anxiety were entered. Suggesting that lack of perseverance is not an artefact of depression and anxiety in emotional eaters. Therefore, emotional eaters may have a

predisposition to not persist in tasks. This may reflect difficulty persisting with negative and confusing states and thus leading to eating.

No support was found for lack of premeditation being associated with emotional eating. This is in contrast to previous findings of Lyke and Spinella (2004) and Yeomans et al. (2008) who reported non-planning impulsivity was associated with eating behaviour in a non-clinical sample. An explanation for this finding might be that a lack of planning could be related to other types of eating rather than emotional eating. For example, not planning meals may make it harder to resist appetizing and easily prepared unhealthy food.

Surprisingly sensation seeking was negatively associated with emotional eating; however it was of marginal significance. Sensation seeking is suggested to load on the domain extraversion. Elfhag and Morey (2008) found that emotional eaters were lower in extraversion. It could be that emotional eaters may be sensitive to stimuli and thus need less stimulation to trigger eating.

As expected emotional eating was associated with alexithymia. Once depression and anxiety were controlled for using partial correlations, total alexithymia and all alexithymia subscales were still positively associated with emotional eating; although the magnitude of the associations was greatly reduced. This corroborates the findings of previous research in clinical populations (Larsen, Geenen et al., 2006; Pinaquy et al., 2003).

Pinquay et al. (2003) suggested that alexithymia was only related to emotional eating in eating disordered populations, with their results showing a relationship between emotional eating and alexithymia only in participants with BED. It has been argued that alexithymia is related to the psychological characteristics of eating disorders rather than to eating behaviour itself (Cochrane et al., 1993; Taylor, Parker, Bagby, & Bourke, 1996) however the results of this study show that the alexithymia/emotional eating association is also applicable to non-eating disordered populations. Furthermore, this study also found that the component of

alexithymia that was most strongly associated with emotional eating was difficulty identifying feelings which was also found by Larsen, Greenen et al. (2006) and Pinaquy et al. (2003). Finding the same relationship between the alexithymia, its components and emotional eating in a normal sample as clinical samples, points to difficulty identifying feelings as a possible underlying component of emotional eating. This finding is theoretically consistent with psychosomatic theory which emphasises the concept of interoceptive awareness. Difficulty with identifying feelings could lead to confusion between internal feelings of hunger and emotions with individuals misattributing emotions as hunger.

While this study's design cannot determine whether alexithymia is a stable and distinct construct from negative affect, the results of this study support that alexithymia is indeed a separate factor associated with eating behaviour as anxiety and depression did not account for all the variance of alexithymia in its association with emotional eating. In the regression analysis only depression and alexithymia emerged as significant predictors of emotional eating with both showing similar standardised coefficients. Surprisingly, anxiety was not a significant predictor of emotional eating. In fact, anxiety did not predict emotional eating over and above depression in the first step of the regression analysis. It is possible that not all negative emotions are created equal when it comes to emotional eating. The results of this study suggest that low mood, lack of motivation and apathy characteristics that are associated with depression may lead to emotional eating rather than tension, agitation and nervousness, characteristics which are prominent in anxiety. However, further research is needed to test this possibility.

One of the main propositions in this thesis was that an inability to identify and describe your feelings may cause you to act rashly and engage in impulsive behaviours. Pearson zero-order correlations showed that there were significant positive associations between alexithymia, urgency and emotional eating. However, this proposition was not

supported by the results of the regression analysis with urgency not being a significant predictor of emotional eating above depression and alexithymia. Furthermore, there was no significant interaction of alexithymia and urgency in predicting emotional eating. While this proposition was not supported in this study, the interaction between alexithymia and urgency in predicting impulsive behaviour could still be worth further study. Emotional eating may not be an impulsive behaviour because it does not always lead to dysregulated eating (Anschutz et al., 2009). Binge eating may be a better eating variable to study the interaction between alexithymia and impulsivity, since binge eating could be considered more of a dysregulated eating behaviour than emotional eating.

External Eating Findings

It was proposed that negative affect makes external eaters narrowly shift their attention toward food stimuli. Heatherton and Baumeister (1991) argued that negative affect especially ego threatening stresses cause individuals to increase awareness of the immediate environment to decrease awareness of the self. Ego-threatening stressors have been associated with increased food intake (Heatherton, Herman, & Polivy, 1991). Since external eaters are driven to eat by environmental cues, an attentional shift caused by negative affect might be expected to increase food intake in these individuals. The findings of this study showed that external eating was associated with higher depression and anxiety.

Ouwens et al. (2009) reported a positive association between depression and external eating; although once impulsivity, as measured by the impulse regulation subscale of the EDI-II was included in the model depression was not directly related to external but mediated by impulse regulation. Consistent with previous research impulsivity was associated with external eating (Ouwens et al., 2009). Urgency and lack of perseverance were the impulsivity dimensions found to be related to external eating in this study. This study replicated the results of Ouwens et al. (2009) utilising the urgency subscale of the UPPS as the measure of

impulsivity since this dimension has been proposed to be associated with negative affect. The findings in the study suggested that the relationship between depression and external eating is fully mediated by urgency, implying that depression is indirectly associated with external eating.

The only other dimension of impulsivity under the UPPS model that was related to external eating was lack of perseverance. It was suggested that lack of perseverance could be an artefact of depression and anxiety and therefore once these factors were controlled for lack of perseverance would no longer be a significant predictor of external eating. This prediction was confirmed by the multiple regression analysis. Therefore, it appears that lack of perseverance is not directly associated with external eating suggesting that urgency is the impulsivity dimension that is related external eating.

The results of this study suggest that impulsivity might explain individual differences in susceptibility to weight gain in the obesogenic environment, impulsive individuals may find it difficult to resist the increasingly prevalent food cues.

Strengths and Limitations

This study utilised widely used and psychometrically sound measures. Therefore, the results of this study can be compared to other studies examining alexithymia, emotional and external eating. The UPPS is a relatively new measure of impulsivity however it is proving to be a popular framework for assessing impulsivity given that it is psychometrically sound and has been shown to be clinically useful (Smith et al., 2007). Furthermore, the UPPS framework allows for the multiple dimensions of impulsivity to be examined in a well-established personality framework. Of the couple of studies that have examined impulsivity in emotional and external eating, the impulse regulation subscale from the EDI-II has been used (Ouwens et al., 2009; van Strien & Ouwens, 2007). This unidimensional subscale of impulsivity does not allow for the understanding of which dimensions of impulsivity are

related to eating behaviour. Furthermore, it is also part of a tool used to diagnose eating disorders therefore it may not be completely independent.

Overall, this sample was comparable to other university samples, showing similar mean scores on the UPPS Impulsive Behavior Scale, TAS-20 and DEBQ and DASS-21 and the mean BMI of the current sample (23.67) was within the normal range. It is important to study a non-clinical sample since research examining correlates of eating behaviour has mainly focussed on clinical samples limiting the knowledge of what contributes to normal eating behaviours. Very few participants in this sample reported a previous diagnosis of an eating disorder (n=17; 7.5%) so post-hoc analysis could not be conducted on this subgroup to see if the findings held or were stronger in an eating disorder group.

While a strength of this study is that a non-clinical sample was used allowing for us to greater understand what contributes to eating behaviour in normal populations, this sample is limited in that the variables were only examined in female university students. This limits the generalizability to the wider general population. Previous research has found that unhealthy weight management practices are rather prevalent in female university samples (Tylka & Subich, 2002). This study did not control for clinical and subclinical eating pathology that may have influenced the results and limited generalizability. Although as previously noted the number of eating disordered participants in this study was low. Furthermore, alexithymia has been associated with lower levels of educational achievement (Lane, Sechrest, & Riedel, 1998).

Likewise the investigation of only females limits the generalizability of this study. Previous research has found that males and females differ in levels of emotional eating, although gender differences have not been found for external eating (Burton et al., 2007; Lluch et al., 2000; Wardle, 1987). Additionally, alexithymia is also found to be more prevalent in males than females (Lane et al., 1998). Therefore, it could be that the

relationship between emotional eating and alexithymia are different for males than for females. In the study by Elfhag and Morey (2008) gender differences were found in emotional and external eating, with women reporting more emotional and external eating. However when a regression analysis was performed with personality predicting emotional and external eating there were no differences in the personality variables predicting eating behaviour between men and women.

The measures used in this study were self-report which may allow the opportunity to misrepresent responses, with socially desirable responding. Additionally, some the variables in this study required self-awareness and some participants may have lacked insight into their own behaviour. Debate has surround whether individuals can accurately classify themselves as emotional eaters (Evers et al., 2009). Several studies have found that individuals who report being emotional eaters on self-report measures do not overeat in stress conditions, thus may not be emotional eaters (Evers et al., 2009). It is argued that people may lack the self-awareness needed to realise if they actually eat in response to negative emotions. It is also argued that some individuals may report emotional eating as this is more acceptable than binge eating (Evers et al., 2009). It is also debated whether alexithymia can be measured accurately by a self-report measure (Havliand, Warren, & Riggs, 2000) since individuals high on alexithymia may lack insight related to emotional awareness.

Lastly the cross-sectional design of this study does not allow for causal relationships to be determined. Despite these limitations these results provide a basis for future research and clinical and theoretical implications for emotional and external eating.

Future Directions

Although causal mechanisms cannot be made this study does show that there are relationships between alexithymia, impulsivity emotional and external eating that should be explored further in future research.

An inability to engage in reflective cognitive processes such as cognitive reappraisal means individuals with alexithymia may rely on reflexive processes. Cognitive reappraisal is when negative thoughts/emotions are monitored and evaluated and replaced with more positive thoughts and is considered a healthy emotion regulation strategy. It is thought that alexithymics, because of their inability to cognitively process their emotions, are unable to engage in cognitive reappraisal of negative emotions. It is proposed that alexithymics engage in unhealthy emotion regulation strategies such as suppression (Shishido et al., 2013). Reliance on suppression strategies is hinted at in the results of this study. Emotional eating is considered to be an escape behaviour from negative experiences thus possibly suppressing emotions. Future research should examine emotion regulation strategies in alexithymics and emotional eaters because it is unclear what motivates emotional eating; is it to escape?, a strategy to alleviate negative affect?, a strategy to supress negative affect? or to increase positive emotion?

The results of this study suggest that depression is not directly associated with external eating but mediated through urgency. Future research should consider the effect of impulsivity when studying attentional biases to food stimuli in external eaters. Furthermore, impulsivity has been proposed to be a risk factor in the development of obesity (Nederkoorn et al., 2006). It may be worthwhile to study external eating as a possible mediating variable in the relationship between impulsivity and obesity.

While this study provides some knowledge of the association between impulsivity and eating behaviour in a non-clinical sample it is unclear of the direction of the relationship. It is

not known whether impulsive individuals are more motivated to eat or if impulsive individuals find it more difficult to refrain from eating when faced with food stimuli. Further research needs to be conducted to clarify whether impulsivity is an independent factor in eating or whether it interacts with motivation.

Implications

While many people admit to at least occasionally engaging in emotional eating, elevated levels are often found in the obese and those with binge eating disorder (de Lauzon-Guillain et al., 2006; Pinaquy et al., 2003; van Strien et al., 2009). Research has shown that those who report emotional eating find it more difficult to engage in healthy lifestyle behaviours (van de Laar et al., 2006; van Strien & Koenders, 2010) implying that emotional eating may lead to later health problems. The results of this study and others have shown that alexithymia is associated with emotional eating and therefore alexithymia could be an important focus of treatment for those who display a tendency to eat when faced with negative emotions. Teaching emotional eaters to accurately identify their feelings may help them make healthy lifestyle changes and learn to use reappraisal strategies to regulate emotions. Furthermore, many psychological treatments rely on emotion regulation and processing for example, cognitive behavioural therapy. Therefore successful treatment outcomes may be hampered by an inability to identify and process emotions as seen in individuals high in alexithymia. Alexithymia has been shown to be an important factor in treatment outcome for eating disorders (Speranza, Loas, Wallier, & Corcos, 2007).

Impulsivity may also be an important factor to target in treatment with individuals who show difficulties with eating. Acting rashly when distressed reduces the opportunities to learn and use adaptive responses to reduce distress. Therefore, overtime these individuals will have less adaptive coping skills and previous unhealthy behaviour will be reinforced. This may lead to a cycle of emotional eating, as emotional eating will be reinforced with the

reduction in negative affect and healthy responses to deal with distress will not have been learned thus the individual may rely on eating as a coping strategy.

It is generally believed that obesity does not have a single cause, but is caused by a complex interplay of genetic, nutritional, environmental, social and psychological factors. Researchers have started examining the changing environment as a cause of the obesity epidemic. Some have labelled the current environment an "obesogenic environment", the increasing prevalence of food advertising, food labelling and the easy availability of energy-dense foods such as fast food and takeaways have been highlighted as a possible cause of obesity. This study has highlighted the interaction between environmental and psychological factors. Impulsivity may explain why some individuals are unable to resist the bombardment of food related stimuli in this "obesogenic environment". Therefore, individual differences in the sensitivity to the external food cues and the tendency to give into impulses when encountering food stimuli is an important part of the picture.

From the results of this study there appear to be different pathways to emotional and external eating. While there were similarities between emotional and external eating, with the zero-order correlations showing similarities in the associations between emotional and external eating and alexithymia, impulsivity and negative affect this was expected given the theoretical similarities between these eating styles. However, the regression analyses added some clarity to the different associations between these variables and emotional and external eating.

Consistent with previous research emotional eating appears to be associated with emotion and affect regulation problems, being directly associated with depression and alexithymia. The direct relationship between negative affect and emotional eating has been proposed by escape theories in which emotional eating is thought to reduce awareness of distress through blocking or dissociation (Hallings-Pott, Waller, Watson, & Scragg, 2005).

Depression was indirectly associated with external eating, mediated by the impulsivity dimension urgency. Urgency was not associated with emotional eating when depression and alexithymia were included in the model. Elfhag and Morey (2008) suggested that negative affect is not a sufficient enough condition to induce emotional eating from their finding that the impulsiveness facet from the neuroticism domain of the FFM was most significantly related emotional eating. They suggested that negative affect and impulsivity interact in producing emotional eating. This proposition was not supported by this study with no main effect of urgency seen in the regression model and the interaction between alexithymia and urgency also being non-significant. Therefore, contrary to the predictions of Elfhag and Morey (2008) and the predictions of this study impulsivity does not appear to be associated with emotional eating, but it does appear to be an important component in external eating.

In the zero-order correlations lack of perseverance was associated with both emotional and external eating. Regression analyses showed that the association of lack of perseverance and emotional and external was different, with lack of perseverance being a significant predictor above depression and anxiety in emotional eating but not for external eating.

Conclusion

In conclusion, the current study indicates that emotional eating is associated directly with affect regulation problems with the results showing an association with alexithymia, depression and anxiety; whereas external eating is indirectly associated with negative affect, with depression being indirectly associated with external eating through the mediating variable urgency. The results of this study suggest that distinct pathways to emotional and external eating exist; therefore the distinction between the two eating styles may be warranted. This study offers suggestions for factors to focus on in the treatment of eating problems. Lastly, the results of this study are important as they elucidate some of the

underlying features in common eating behaviours in a normal sample; since knowledge and research of the correlates of eating behaviour in unrestrained, non-eating disordered populations has been limited.

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Appendix A

Ethics Approval

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Ref: HEC 2012/75

19 July 2012

Christina Pike
Department of Psychology
UNIVERSITY OF CANTERBURY

Dear Christina

The Human Ethics Committee advises that your research proposal "The role of impulsivity in the relationship between Alexithymia and Problematic eating behaviours" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 17 July 2012.

Best wishes for your project.

Yours sincerely

Michael Grimshaw
Chair
University of Canterbury Human Ethics Committee

Appendix B

Information Sheets

Information Sheet Online Participants

College of Science
Department of Psychology
Tel: 64-03-364 2902 Fax: 64-03-364 2181
Email: psychology@canterbury.ac.nz
Web site: http://www.psyc.canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Information Sheet Online Participants

The Role of Impulsivity in the Relationship between Alexithymia and Eating Behaviours

Please read the following note before completing the questionnaires.

You are invited to participate in the research project "The Role of Impulsivity in the Relationship between Alexithymia and Eating Behaviours" by completing some questionnaires. Completion of the questionnaires will take approximately 30 minutes. You have the right to withdraw without penalty from this study at any time until your responses are submitted.

The aim of the project is to explore the association of impulsivity and alexithymia (the ability to identify and describe emotions/feelings) in predicting eating behaviour.

The project is being carried out as a requirement for the degree Master of Science by Christina Pike under the supervision of Dr Janet Carter, who can be contacted at (03) 364 2987 ext. 8090. She will be pleased to discuss any concerns you may have about participation in the project.

On completion of this study, you will be given the opportunity to go into the draw to win 1 of 3 $50 vouchers.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: the identity of participants will not be made public without their consent. To ensure confidentiality, data collected will only be accessible by the researchers of this project. All data collected for this study will be kept in locked and secure facilities at the University of Canterbury and will be destroyed after five years.

If at any time you feel that completing these questionnaires has raised issues for you, you can contact the University Health Centre, Lifeline or Dr Janet Carter (clinical psychologist) for support. Their contact details are listed below.

University Health Centre	Lifeline	Dr Janet Carter
(03) 364 2402	(03) 366 6743	(03) 364 2987 ext. 8090
healthcentre@canterbury.ac.nz	or 0800 543 354	janet.carter@canterbury.ac.nz

If you wish to receive a copy of the study results please email Christina Pike on christina.pike@pg.canterbury.ac.nz or Janet Carter on janet.carter@canterbury.ac.nz

By completing the questionnaire it will be understood that you have consented to participate in the project, and that you consent to publication of the results of the project.

This project has been reviewed ***and approved*** by the University of Canterbury Human Ethics Committee.

Any comments about the ethical standards of this research can be made by contacting:

The Chair, University of Canterbury Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch. human-ethics@canterbury.ac.nz

Information Sheet Participant Pool Participants

College of Science
Department of Psychology
Tel: 64-03-364 2902 Fax: 64-03-364 2181
Email: psychology@canterbury.ac.nz
Web site: http://www.psyc.canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Information Sheet Participant Pool

The Role of Impulsivity in the Relationship between Alexithymia and Eating Behaviours

Please read the following note before completing the questionnaires.

You are invited to participate in the research project "The Role of Impulsivity in the Relationship between Alexithymia and Eating Behaviours" by completing some questionnaires. Completion of the questionnaires will take approximately 30 minutes. You have the right to withdraw from the project at any time, including withdrawal of any information provided without penalty.

The aim of the project is to explore the association of impulsivity and alexithymia (the ability to identify and describe emotions/feelings) in predicting eating behaviour.

The project is being carried out as a requirement for the degree Master of Science by Christina Pike under the supervision of Dr Janet Carter, who can be contacted at (03) 364 2987 ext. 8090. She will be pleased to discuss any concerns you may have about participation in the project.

You will receive course credit for PSYC106 for your participation in this research.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: the identity of participants will not be made public without their consent. To ensure confidentiality, data collected will only be accessible by the researchers of this project. All data collected for this study will be kept in locked and secure facilities at the University of Canterbury and will be destroyed after five years.

If at any time you feel that completing these questionnaires has raised issues for you, you can contact the University Health Centre, Lifeline or Dr Janet Carter (clinical psychologist) for support. Their contact details are listed below.

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By completing the questionnaire it will be understood that you have consented to participate in the project, and that you consent to publication of the results of the project.

This project has been reviewed ***and approved*** by the University of Canterbury Human Ethics Committee.
Any comments about the ethical standards of this research can be made by contacting:

The Chair, University of Canterbury Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch. human-ethics@canterbury.ac.nz

Appendix C

Demographic Questionnaire

What is your age:

Which ethnic group(s) do you belong to?

- ☐ New Zealand European
- ☐ Maori
- ☐ Samoan
- ☐ Cook Island Maori
- ☐ Tongan
- ☐ Niuean
- ☐ Chinese
- ☐ Indian
- ☐ Other (please state: e.g. Dutch, Japanese, Tokelauan)

How many years of tertiary study have you completed?

What is your weight (kg) (if unsure please estimate):

What is your height (centimetres) (if unsure please estimate):

Have you ever been diagnosed or treated for an eating disorder(s)?

- ☐ Yes
- ☐ No

If yes, please specify the eating disorder(s) you were diagnosed/ treated for:

- ☐ Anorexia Nervosa
- ☐ Bulimia Nervosa
- ☐ Binge Eating Disorder
- ☐ Eating Disorder Not Otherwise Specified

Have you ever been diagnosed or treated for any mental illness(es) (e.g. Depression or Anxiety)?

- ☐ Yes
- ☐ No

If yes, please specify the mental illness(es) you were diagnosed/treated for:

Appendix D

Dutch Eating Behaviour Questionnaire

Below are a number of questions. For each question, please select the response that best applies to you.

		Never	Seldom	Sometimes	Often	Very Often
1.	If you have put on weight, do you eat less than you usually do?	1	2	3	4	5
2.	Do you have the desire to eat when you are irritated?	1	2	3	4	5
3.	Do you eat more than usual when you see others eating?	1	2	3	4	5
4.	Do you have a desire to eat when you have nothing to do?	1	2	3	4	5
5.	Do you have a desire to eat when you are feeling lonely?	1	2	3	4	5
6.	Can you resist delicious foods?	1	2	3	4	5
7.	If you see others eating, do you also have the desire to eat?	1	2	3	4	5
8.	Do you get the desire to eat when you are anxious, worried or tense?	1	2	3	4	5
9.	Do you watch exactly what you eat?	1	2	3	4	5
10.	Do you have a desire to eat when you are depressed or discouraged?	1	2	3	4	5
11.	If you walk past a snack bar or café, do you have the desire to buy something delicious?	1	2	3	4	5
12.	Do you try to eat less at mealtimes than you would like to eat?	1	2	3	4	5
13.	How often do you refuse food or drink offered because you are concerned about your weight?	1	2	3	4	5
14.	Do you have a desire to eat when you are cross?	1	2	3	4	5
15.	If you walk past the baker do you have the desire to buy something delicious?	1	2	3	4	5
16.	Do you have a desire to eat when things are going against you or when things have gone wrong?	1	2	3	4	5

17.	Do you deliberately eat foods that are slimming?	1	2	3	4	5
18.	If you have something delicious to eat, do you eat it straight away?	1	2	3	4	5
19.	Do you have a desire to eat when somebody lets you down?	1	2	3	4	5
20.	When you have eaten too much, do you eat less than usual the following days?	1	2	3	4	5
21.	If you see or smell something delicious, do you have a desire to eat it?	1	2	3	4	5
22.	Do you have a desire to eat when you are frightened?	1	2	3	4	5
23.	If food smells and looks good, do you eat more than usual?	1	2	3	4	5
24.	Do you have a desire to eat when you are approaching something unpleasant to happen?	1	2	3	4	5
25.	Do you take into account your weight with what you eat?	1	2	3	4	5
26.	Do you have a desire to eat when you are disappointed?	1	2	3	4	5
27.	How often in the evening do you try not to eat because you are watching your weight?	1	2	3	4	5
28.	If food tastes good to you, do you eat more than usual?	1	2	3	4	5
29.	Do you have a desire to eat when you are bored or restless?	1	2	3	4	5
30.	How often do you try not to eat between meals because you are watching your weight?	1	2	3	4	5
31.	Do you have a desire to eat when you are emotionally upset?	1	2	3	4	5
32.	Do you deliberately eat less in order not to become heavier?	1	2	3	4	5
33.	When preparing a meal are you inclined to eat something?	1	2	3	4	5

Appendix E

UPPS Impulsive Behavior Scale

Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement.

		Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1.	I have a reserved and cautious attitude toward life.	1	2	3	4
2.	I have trouble controlling my impulses.	1	2	3	4
3.	I have trouble resisting my cravings (for food, cigarettes, etc.).	1	2	3	4
4.	I generally seek new and exciting experiences and sensations.	1	2	3	4
5.	In the heat of an argument, I will often say things that I later regret.	1	2	3	4
6.	I would enjoy the sensation of skiing very fast down a high mountain slope.	1	2	3	4
7.	I generally like to see things through to the end.	1	2	3	4
8.	I often make matters worse because I act without thinking when I am upset.	1	2	3	4
9.	When I feel rejected, I will often say things that I later regret.	1	2	3	4
10.	My thinking is usually careful and purposeful.	1	2	3	4
11.	I would like to go scuba diving.	1	2	3	4
12.	I would enjoy water skiing.	1	2	3	4
13.	Before I get into a new situation I like to find out what to expect from it.	1	2	3	4
14.	I quite enjoy taking risks.	1	2	3	4
15.	I often get involved in things I later wish I could get out of.	1	2	3	4

16.	I tend to give up easily.	1	2	3	4
17.	I am a cautious person.	1	2	3	4
18.	When I am upset I often act without thinking.	1	2	3	4
19.	Unfinished tasks really bother me.	1	2	3	4
20.	I am not one of those people who blurt out things without thinking.	1	2	3	4
21.	I usually make up my mind through careful reasoning.	1	2	3	4
22.	I like sports and games in which you have to choose your next move very quickly.	1	2	3	4
23.	I like to stop and think things over before I do them.	1	2	3	4
24.	I don't like to start a project until I know exactly how to proceed.	1	2	3	4
25.	I would enjoy fast driving.	1	2	3	4
26.	Once I get going on something I hate to stop.	1	2	3	4
27.	I sometimes like doing things that are a bit frightening.	1	2	3	4
28.	It is hard for me to resist acting on my feelings.	1	2	3	4
29.	Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.	1	2	3	4
30.	I concentrate easily.	1	2	3	4
31.	I am always able to keep my feelings under control.	1	2	3	4
32.	I finish what I start.	1	2	3	4
33.	I would like to learn to fly an airplane.	1	2	3	4
34.	Before making up my mind, I consider all the advantages and disadvantages.	1	2	3	4
35.	I usually think carefully before doing anything.	1	2	3	4
36.	I'll try anything once.	1	2	3	4

37.	Sometimes I do things on impulse that I later regret.	1	2	3	4
38.	I tend to value and follow a rational, ``sensible'' approach to things.	1	2	3	4
39.	I'm pretty good about pacing myself so as to get things done on time.	1	2	3	4
40.	I am a productive person who always gets the job done.	1	2	3	4
41.	I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.	1	2	3	4
42.	I would enjoy parachute jumping.	1	2	3	4
43.	When I feel bad, I will often do things I later regret in order to make myself feel better now.	1	2	3	4
44.	Once I start a project, I almost always finish it.	1	2	3	4
45.	There are so many little jobs that need to be done that I sometimes just ignore them all.	1	2	3	4

Appendix F

Toronto Alexithymia Scale – 20

Below are a number of statements. For each statement, please indicate how much you agree or disagree with the statement.

		Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
1.	I am often confused about what emotion I am feeling.	1	2	3	4	5
2.	It is difficult for me to find the right words for my feelings.	1	2	3	4	5
3.	I have physical sensations that even doctors don't understand.	1	2	3	4	5
4.	I am able to describe my feelings easily.	1	2	3	4	5
5.	I prefer to analyze problems rather than just describe them.	1	2	3	4	5
6.	When I am upset, I don’t know if I am sad, frightened, or angry.	1	2	3	4	5
7.	I find it hard to describe how I feel about people.	1	2	3	4	5
8.	I prefer to just let things happen rather than to understand why they turned out that way.	1	2	3	4	5
9.	I have feelings that I can't quite identify.	1	2	3	4	5
10.	Being in touch with emotions is essential.	1	2	3	4	5
11.	I am often puzzled by sensations in my body.	1	2	3	4	5
12.	People tell me to describe my feelings more.	1	2	3	4	5
13.	I don't know what's going on inside me.	1	2	3	4	5
14.	I often don't know why I am angry.	1	2	3	4	5
15.	I prefer talking to people about their daily activities rather than their feelings.	1	2	3	4	5

16.	I prefer to watch "light" entertainment shows rather than psychological dramas.	1	2	3	4	5
17.	It is difficult for me to reveal my innermost feelings, even to close friends.	1	2	3	4	5
18.	I can feel close to someone, even in moments of silence.	1	2	3	4	5
19.	I find examination of my feelings useful in solving personal problems.	1	2	3	4	5
20.	Looking for hidden meanings in movies or plays distracts from their enjoyment.	1	2	3	4	5

Appendix G

Depression, Anxiety and Stress Scale - 21

DASS21

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree, or a good part of time
3 Applied to me very much, or most of the time

1	I found it hard to wind down	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I couldn't seem to experience any positive feeling at all	0	1	2	3
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5	I found it difficult to work up the initiative to do things	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I experienced trembling (eg, in the hands)	0	1	2	3
8	I felt that I was using a lot of nervous energy	0	1	2	3
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting agitated	0	1	2	3
12	I found it difficult to relax	0	1	2	3
13	I felt down-hearted and blue	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3